American

1859 *Centennial Year* 1959

Gas Journal

ONLY MAGAZINE EDITED EXCLUSIVELY FOR THE GAS DISTRIBUTION INDUSTRY

MAY 1959

in this issue:

what to do about....

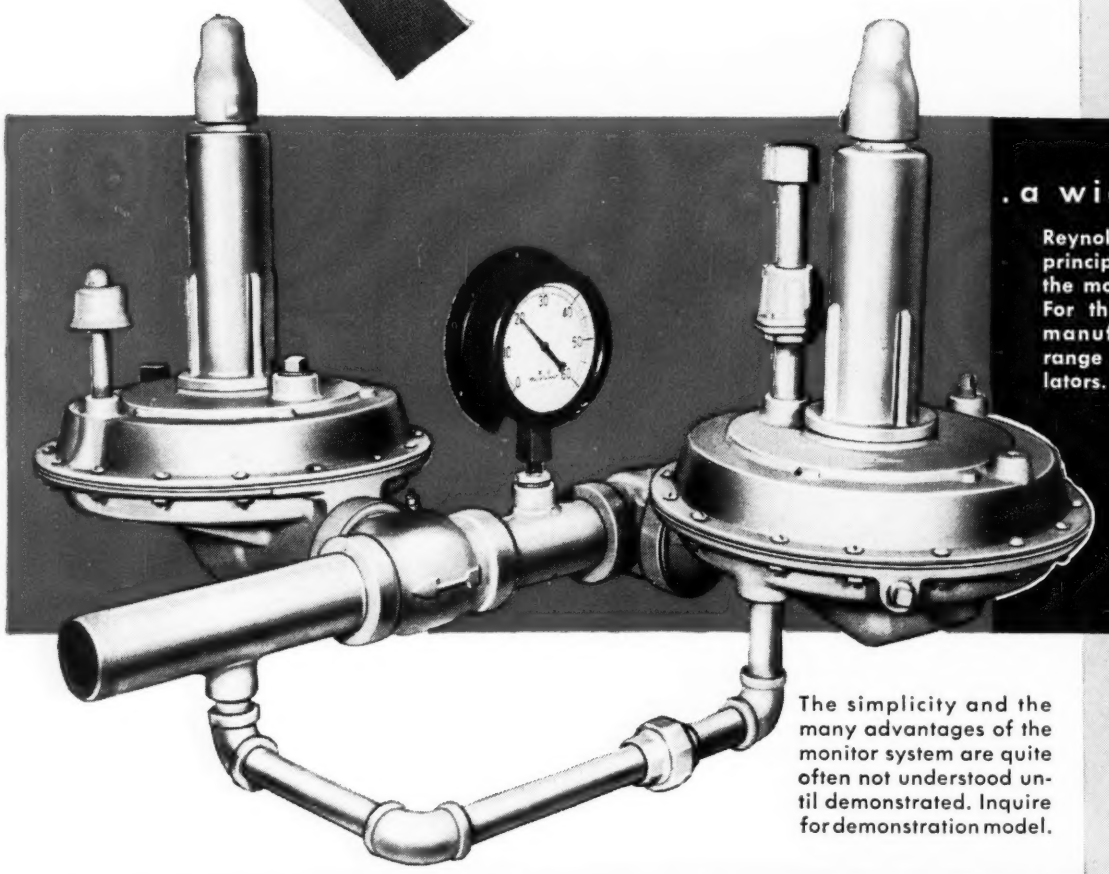
RISING COSTS

How and Why Costs Have Risen....Control of Overhead Costs....Why Not Try "Costimating"? ....Maintaining Distribution Valves....Photography: Useful New Tool....Internal Sealing Cuts Costs

Reynolds offer

UPSTREAM MONITORING

The monitor systems give continued regulation at a slightly higher pressure without relieving gas or shutting off the gas. This system can handle temporary or permanent failures of the operating regulator. The monitor is in semi-operation when the operating regulator is functioning properly. Therefore, you have both regulators in motion at all times. The cost of an operating regulator and operating monitor regulator is less than the cost of a regulator and a full capacity relief valve with its vent piping or the cost of a regulator and shut-off valve.



. a wide range

Reynolds is one of the principal advocates of the monitoring system. For this purpose they manufacture a wide range of monitor regulators.

The simplicity and the many advantages of the monitor system are quite often not understood until demonstrated. Inquire for demonstration model.

REYNOLDS GAS REGULATOR CO., INC. *Anderson, Indiana*

A Subsidiary of Arkansas Louisiana Gas Company

SEP 26 1960

1859 1959
CENTENNIAL YEAR

American Gas Journal

ONLY MAGAZINE EDITED EXCLUSIVELY FOR THE GAS DISTRIBUTION INDUSTRY

Volume 186 May 1959 Number 5

PILOT.. ..LIGHTS

A Penny Saved . . .

As Ben Franklin said, is a penny earned. In today's spiraling economy, where costs rise like moon-missiles, measures taken to save pennies are more likely to be needed to "keep up" than to add to earnings. In the gas distribution industry, at least, that seems to be the case. Rates, assuredly, aren't keeping up with utility expenses and to make up the difference between expenses and revenues so that some return on investment is realized, gas distribution companies are taking close looks at the many possible ways of reducing costs without reducing operating effectiveness.

In this issue is a to-the-point report developed from the notebook of AGJ's editor, Dean Hale. Comprehensive? Yes. Complete? No . . . for, notes editor and observer Hale, volumes could be written on the subject without covering all the salient points. In the report, however, are examples of what's happening . . . and suggestions — offered by gas distribution men around the country — on ways and means of reducing costs.

*

Hold That Pose

Even the simple "box Brownie" camera can help provide better understanding of equipment installation practices . . . as outlined in John Betty's article on "Picture Your Problems." At Laclede Gas, where simple photographs are replacing complex isometric diagrams, the new technique is speeding up service installations and increasing productivity. Details on page 34.

*

A Shot of Grease, George

Planned, preventive maintenance on distribution system valves is good insurance that . . . when and if the valve is needed . . . it will work. Experiences at New Orleans Public Service . . . and suggestions on how to develop programmed maintenance . . . are offered in C. R. Newlin's informative discussion beginning on page 47.

*

What Will It Cost?

How do you estimate costs on planned distribution construction . . . haphazardly or scientifically? At Minneapolis Gas Company, they use the "Cost-imating" technique . . . and it's proving itself sound. By changing guess-timates to estimates, you can save money. How it's done is explained beginning on page 30.

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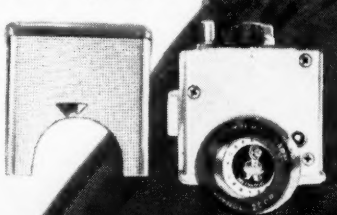

New "slip-top" cover conceals knobs... reduces tampering.

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NEWS HILITES OF THE INDUSTRY

300,000 Washington Gas Light Customers Lose Out to 35 Maryland Property Owners. Action taken by a small group of legislators in Maryland's General Assembly in late March has proved again that a small, vociferous body of politicians can flaunt and disregard the public interest as it sees fit . . . and shroud its actions with secrecy without accounting to anyone. That seems to be the current situation in the five-year battle by Washington Gas Light Company to obtain underground storage rights in Prince Georges County in Maryland. At a secret meeting, the county delegation to the Maryland legislative body rejected — without explanation — WGL's request for power of eminent domain. The delegation's leader, acting as sole spokesman for the group, said only that the bill had been "tabled for this session." *Another delegate said that group "definitely decided against" giving any reason for the action, noting that "the public should try to understand that this was a decision we, and no one else, had to make."*

WGL had requested power of eminent domain to condemn land for underground storage in the Brandywine area of Prince Georges County. The measure rejected by the county delegation was armed with rigid safety controls over gas storage and would have provided powers for four state regulatory agencies, including the state department of health, to police the storage operation, in addition to the state PSC. Introduction of the bill brought to a head a long simmering dispute between a small "holdout" group of approximately 35 property owners vehemently opposed to the storage plan and WGL, which wants to store approximately 30 billion cu ft of natural gas in a 10,000 acre underground storage reservoir.

Development of the field, declared WGL, would enable the company to help stabilize rates for all of its more than 300,000 customers and enable it to provide better service. The small — and apparently a victorious minority — group of opposing property owners fighting the legislation claimed gas storage would contaminate water supplies, create the danger of an explosion, and reduce property values.

Oscar Berry, WGL vice president and chief legal counsel, said he was "bitterly disappointed that five years of work seems to have meant so little." He said the company was not going to give up negotiation with hold-out property owners, but that it would take time to evaluate the ultimate effect of the setback. He noted that the possibility of outright purchase of the land from the hold-out group was slim because "the asking price is astronomical."

Delays in natural gas export are curtailing development of the entire Canadian gas industry, John W. Proctor, general manager of the Canadian Petroleum Association, told government officials in Ottawa and Edmonton recently. Export markets can be lost by further delay and any proposed regulation. "We stand ready to export the proved growing surpluses of Canadian natural gas while protecting domestic supplies and users," Proctor told officials in a direct rebuttal to a brief filed by the City of Calgary's gas committee. "We cannot stand idly by," Proctor continued, "with over 870 Alberta natural gas wells completed and shut-in, awaiting a market, while a committee armed with incomplete facts places before the government a brief demanding in effect a continuing program of stagnation for the gas industry."

Whirlpool Corporation will be the major home appliance manufacturer-sponsor of the 1959 Mrs. America Contest. Successor to the current Mrs. America — Helen Giesse of Cleveland, Ohio — will be selected in finals competition June 23 in Fort Lauderdale, Florida. More than 50,000 homemakers are expected to compete for the Mrs. America crown and prizes totaling $50,000 that will be awarded in this year's contest. Among the prizes will be a Mrs. America Kitchen designed by Whirlpool Corporation, and a two-week all-expense paid trip to Mexico and South America and to Florida.

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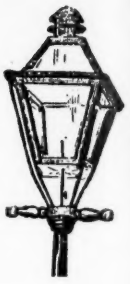
Profile by Gas Light



Carl Cloud: Pioneering President

FROM "HIRED HAND" TO PRESIDENT — that's Carl Cloud's life history in a nutshell. And, as president of the Southern Gas Association and president of the MidSouth Gas Company, he feels keenly his responsibility to the industry that has been his life's work.

CARL CLOUD'S career might well be tagged a Horatio Alger story in the gas industry. It began in dead seriousness. It is still unwinding in that same dedicated pattern that began when he worked his way through college in five years.

Carl Cloud never takes any decision lightly in the gas industry. The fact that he was the first student to graduate from Oklahoma University with a degree in Gas Engineering points up the pioneering spirit of his career.

And it comes as no surprise that he was able to pay his way through college by working part-time and summers for Oklahoma Natural Gas Company.

Although Carl Cloud rose to general superintendent of operations for Oklahoma Gas Company, fate tapped him on the shoulder when a new and expanding gas company in Arkansas sent out a call for him.

Again his pioneering spirit carried the day and he decided not to cast his lot with a large and well established company but face the challenge of building a smaller property into greatness.

With his customary analytical approach to problems, Cloud considered many facets before he made his decision to cross the gas Rubicon. But once he crossed it, he hasn't looked back — even though there have been opportunities to do so.

In building his new company, The MidSouth Gas Company, with home

Carl Cloud

offices in Little Rock, Arkansas, he brought into play many elements of experience. His management training with Stone and Webster, his War Production Board operations and his broad background of engineering and construction with Oklahoma Natural combined to help him set a sound course.

As president, he had a new challenge — one he had never met before — the challenge of selling. Not only selling merchandise, but also selling several hundred employees on himself, his program, his approach to building a company. He had to sell city councils and city officials on a program of expansion. He had to sell higher gas rates in eastern Arkansas than in western Arkansas. He had to sell a board of directors on investing in a $1,000,000 river crossing at Memphis so he could tie into the Texas Gas Transmission line. And, of course, he had to see that his company developed a hard-hitting sales force to get the entire program off the ground in new territory.

Here again he proved his ability to adjust and meet the situation at hand. His engineering background helped him make sound operating decisions. But, in addition, he launched into the field of selling in a way that is difficult for most beginners. He set aside his slipstick. He took stock of problems and opportunities in things and people. He employed psychological counsel to help him make sound management decisions in helping place the right responsibility on the right people.

Today, just seven years later, his pioneering instincts have proved sound. The MidSouth Gas Company today is well known in the gas industry. This was not true seven years ago.

As a member of Ebasco, his company has been pointed to time and time again for its accomplishments in overall company participation in selling. He sold his board of directors on giving board status to his able vice president in charge of sales, R. P. Hill.

In short, Carl Cloud is making a mark that is highly respected in America's fifth largest industry. Yet, his career has just begun. He is only 45 years old.

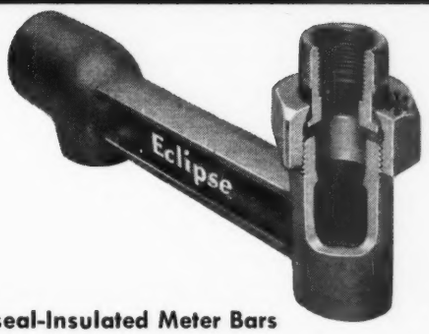
However, as his friends are quick to admit, there's a lot of mileage in those years. As a member of the board of directors of the American Gas Association, Carl Cloud has an opportunity to see the greater destiny of the gas industry in the overall sales war ahead to supply energy fuels. He is already thinking 10 years from today — wondering, planning, projecting just where his company will be.

The theme of the SGA annual convention reflects this concern for '59-'69 — *The Decade of Decision*. His president's address calls forth the type of thinking that will help build a greater industry in a greater country.

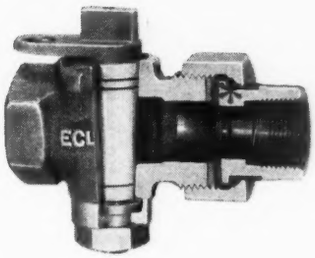
Yes, Carl Cloud is a small town country boy from Pickneyville, Illinois, who is making good.

But this is not surprising. He planned it that way. * * *

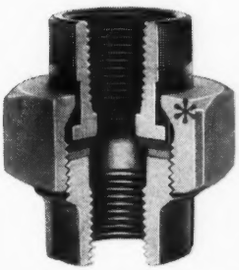
4-Ways Better Insulation against house currents



Wedgeseal-Insulated Meter Bars
— for tin (5-Lt through 30-Lt), aluminum and iron case meters in variety of connection sizes, with or without integral gas cock.



Wedgeseal-Insulated Gas Cock
— offered in lock wing and flat head styles, standard and "Retained Key" (tamperproof) construction. In ¾", 1", and 1¼" sizes. Individually tested with 125-lb air under liquid.



Wedgeseal-Insulated Union
— available in ⅜", ¾", 1", and 1¼" sizes. Recommended for working pressures up to 150 psig.

ECLIPSE *Wedgeseal*® INSULATOR

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3 **WON'T DETERIORATE**—nylon (Zytel 105) is not affected by natural, manufactured, or LP gas; is form stable at 400° F, and suitable for continuous operation at 275° F.

4 **SIMPLIFIES INSTALLATION**—assembly of insulation is eliminated, and Wedgeseal-insulated gas cocks and meter bars reduce number of threaded fittings and make-up time.

Add it up—4-way protection against metal-to-metal contact, against shorting or jumping. Wedgeseal is the strongest, simplest, most economical insulator you can use. Prove it out at no cost—send for a free Wedgeseal-insulated unit today. Use the convenient coupon.

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METER BAR No..... ..... x ..... for ☐ tin, ☐ aluminum or iron case.

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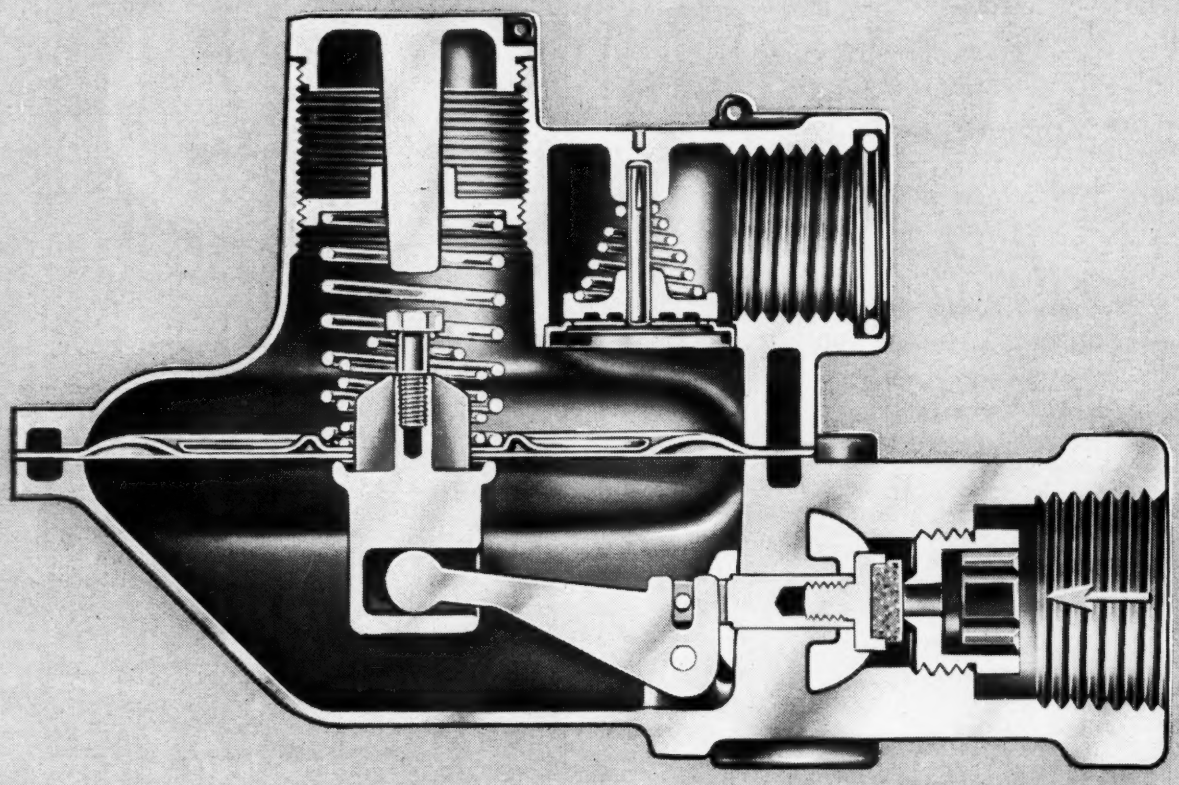
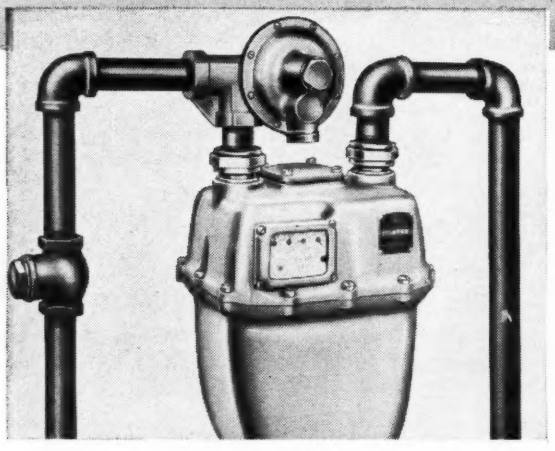
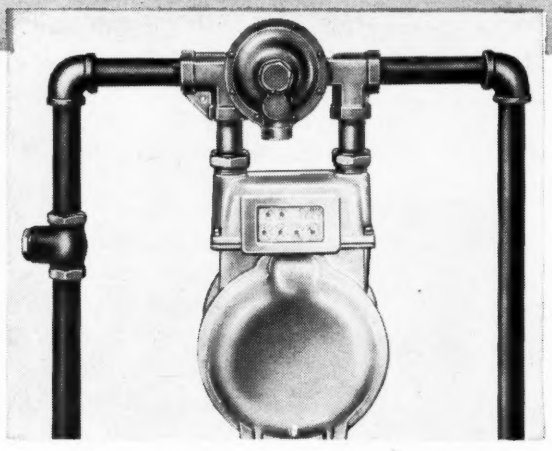
THE LEADER LEADS AGAIN

Fisher announces a new



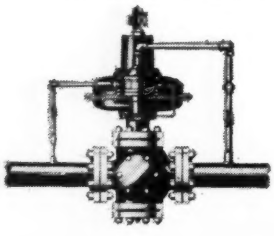


The new Fisher S250 service regulator makes a compact and neat installation. Installation problems are simplified and costs are lowered.



The S250 regulator with integral meter bar will be available soon. This new low cost regulator is a natural for the ultimate in piping hook up.

Write for Bulletin P-S250



IF IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD . . . CHANCES ARE IT'S CONTROLLED BY . . .

low cost service regulator

SERIES S250

designed to handle 99% of all domestic installations

Good news for the gas industry! Fisher now offers a new domestic service regulator designed especially for installations requiring 250 CFH regulating capacity or less. The new Series S250 is not only lower cost due to the compact design, but it meets the requirements of 99% of all domestic installations.

Capacity-wise the Fisher S250 service regulator is the companion of the compact meters now available. This enables you to make a *LOWER COST, COMPLETE* customer service.

The Series S250 consists of Type S251 standard regulator with compact screened vent (no internal relief valve) and Type S252 with *full capacity* internal relief valve and large weatherproof vent.

Aluminum body and lower casing are one piece construction. The "elbow" type body reduces your installation costs.

Design features body sizes ¾ and 1″ with orifice size ⅛, 3/16, ¼, ⅜″.

Capacity 250 CFH or more with or without full capacity internal relief.

Suitable for upstream pressures up to 100 psi and springs available for reduced pressures from 3½″ W.C. to 15″ W.C.

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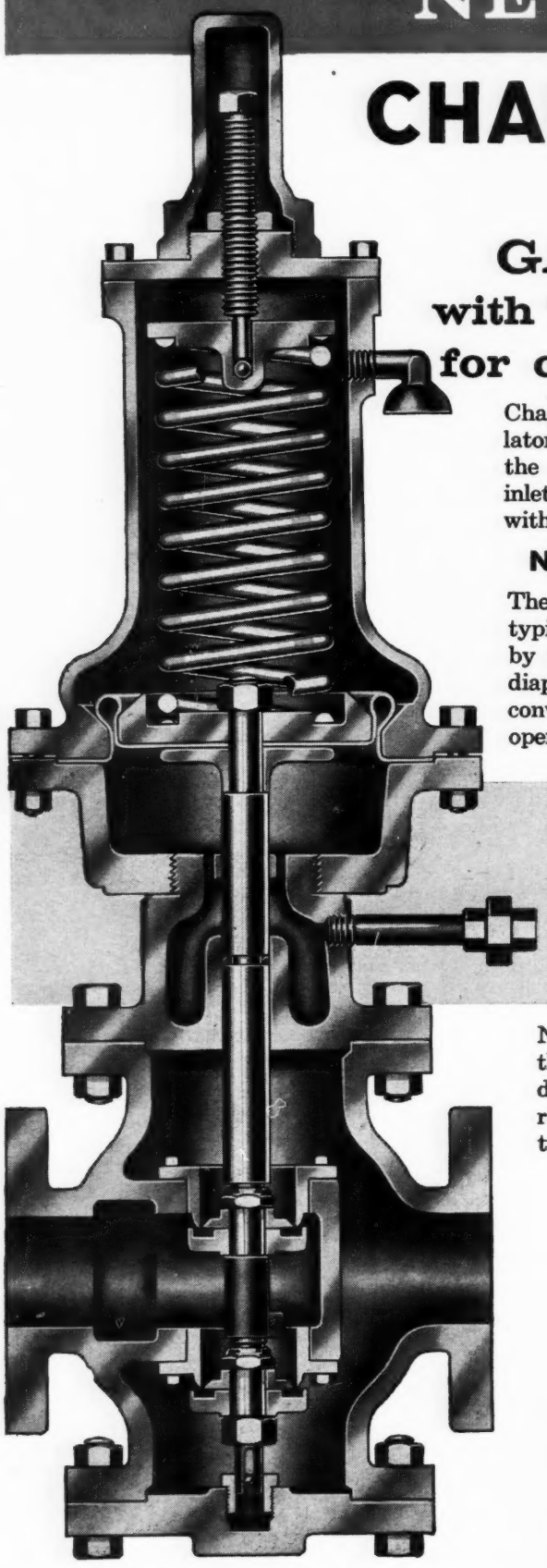
NEW IN DESIGN!



CHAPLIN-FULTON

Model 57-S

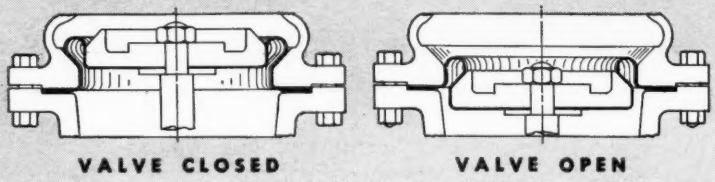
GAS REGULATOR
with "ROLL-OUT" Diaphragm for constant pressure control

Chaplin-Fulton Model 57-S is a simple spring loaded regulator which performs like a pilot loaded regulator, without the added complications. For pounds-to-pounds service—inlet pressures to 400 psi—controlled pressures to 75 psi, with deviation through full valve travel less than 1 psi.

NO "FALL-OFF" AS FLOW INCREASES

The drooping characteristics or outlet pressure "fall-off", typical of conventional spring regulators, is eliminated—not by using an uncontrollable velocity effect—but by a new diaphragm design which actually reverses the action of a conventional diaphragm. It changes its area as the valve opens to compensate for the loss in spring loading force.

"ROLL-OUT" DIAPHRAGM PRINCIPLE



VALVE CLOSED VALVE OPEN

Note how, with the valve upwards in the closed position, the diaphragm achieves its maximum effective area—and decreases as the valve opens. The area changes at the same rate as the spring loses compression, to give a constant controlled pressure—determined entirely by valve movement.

2" - 3" - 4" - 6"
Write for Bulletin 57-S

ACCURATE CF MFG CO DEPENDABLE

Chaplin-Fulton
MANUFACTURING COMPANY
Pittsburgh 25, Pennsylvania

NEW PRODUCT ANNOUNCEMENT

DRESSER®
STOP-N-GO
Trademark
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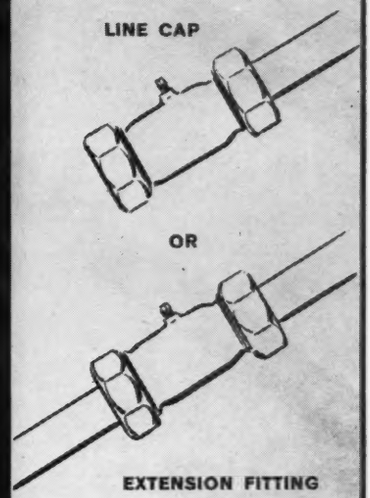

CAP your new distribution lines with the "Stop-N-Go" fitting. To extend the line; remove the end nut and line cap, replace the end nut to hand-tightened pressure and stab the pipe into the fitting breaking the diaphragm seal. Wrench tighten the end nut using about 75 pounds pull on a 24" wrench and you get a permanent, gas-tight joint.

One fitting doubles as line cap and main extension fitting

The new Dresser Style 90 "Stop-N-Go" fitting makes utility expansion easy. When you're laying a new 2" distribution line, cap it off with the "Stop-N-Go"; when you're ready to extend the line, a simple manual operation converts it into a main extension fitting. One fitting for two jobs! Saves money, time, and extensions can be made without shutting off the main (pressures should not exceed 30 psi while extension is being made).

Like all Dresser Fittings, the "Stop-N-Go" makes a permanent leakproof joint with no threading or welding of pipe, takes up to 6° of misalignment and axial deflection, and is rapidly and easily installed with only a wrench. The standard Dresser warranty applies to this and all Dresser products. For further information and specification data on the "Stop-N-Go," write for free bulletin, Dresser Manufacturing Division, Bradford, Pa.

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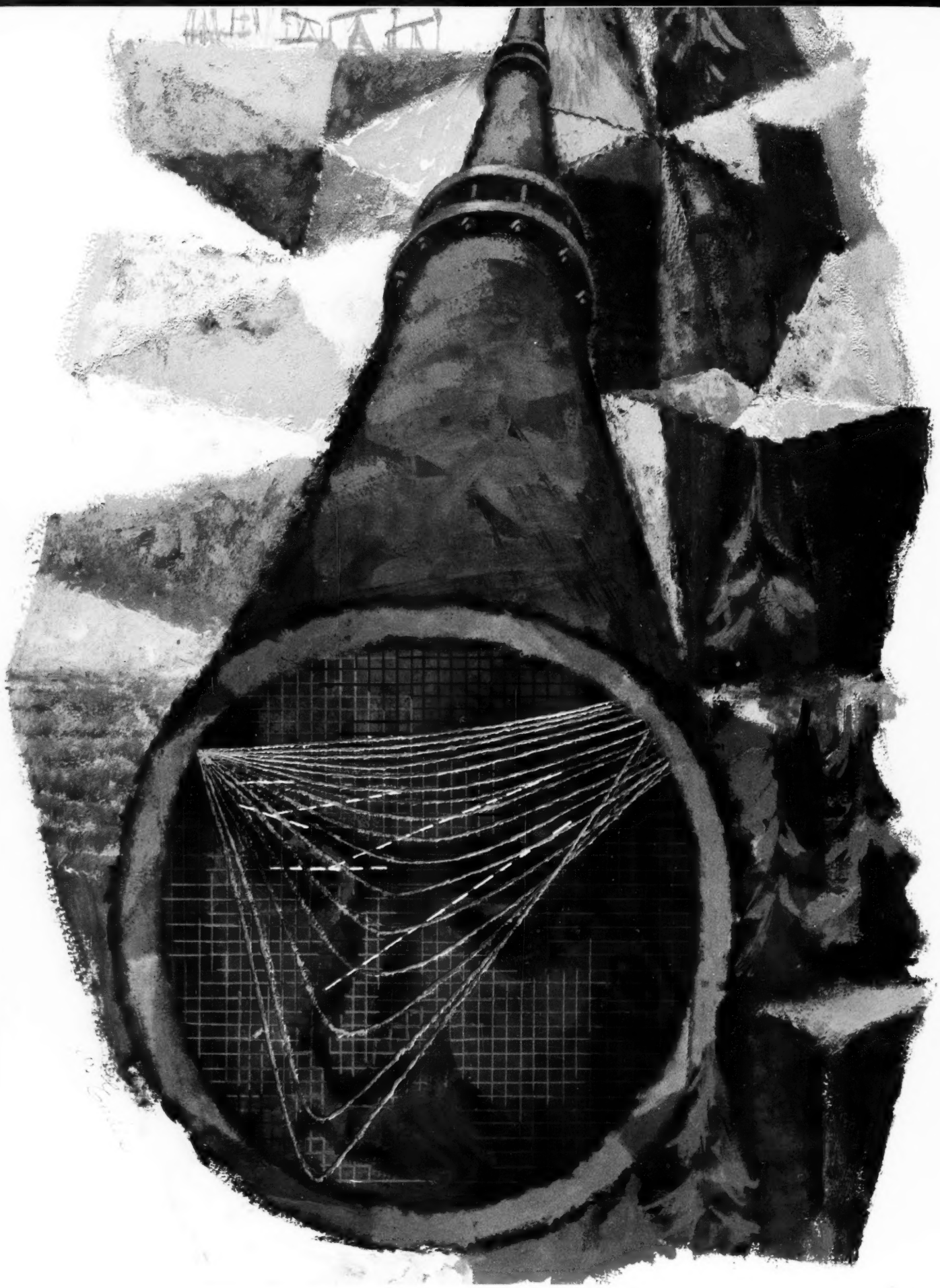

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GUIBERSON

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electronic transformer
development-manufacture

IDECO Inc.

IDECO, INC.
complete drilling rigs

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A graph of gas compressibility factors veiling the face of an imaginative man, at left, thematically shows the complexities of the tremendous task of moving the nation's daily production of natural gas to virtually every community. The Dresser companies are leaders in the manufacturing of vital equipment for all phases of this vast gas industry. Throughout the free world's oil, gas, chemical and electronic industries, Dresser products and technical services have long been known as the standard of comparison.

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WELL SURVEYS, INC.
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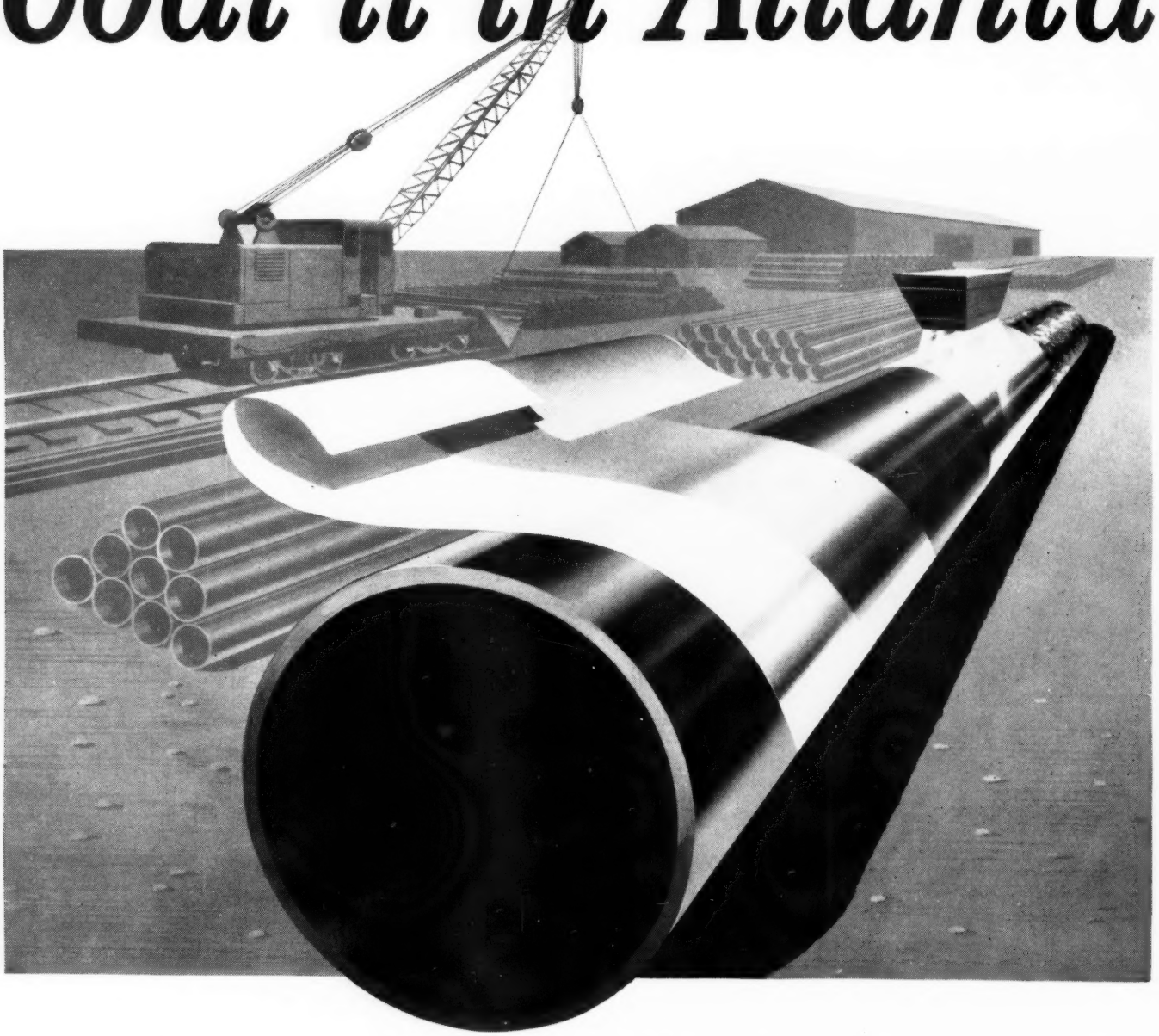
Coat it in Atlanta



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COMING EVENTS IN THE GAS DISTRIBUTION INDUSTRY

May

3- 6 LPGA annual meeting, Conrad Hilton Hotel, Chicago, Illinois.

5- 7 14th Purdue Industrial Waste Conference, Purdue Memorial Union Building, Lafayette, Indiana.

5- 7 A.G.A. research and utilization conference, Cleveland, Ohio.

7 Symposium on Corrosion Inhibitors, Theory and Mechanism, sponsored by Armour Research Foundation and Chicago Section of Electrochemical Society, Illinois Institute of Technology, Chicago, Illinois.

11-12 A.G.A. eastern sales conference, Netherland-Hilton Hotel, Cincinnati, Ohio.

18-19 A.G.A. transmission and storage conference, Statler-Hilton Hotel, Dallas, Texas.

18-20 A.G.A. midwest sales conference, Edgewater Beach Hotel, Chicago, Illinois.

19-21 Pennsylvania Gas Association, annual meeting, Pocono Manor, Pennsylvania.

21-22 Natural Gas & Petroleum Association of Canada, annual meeting, Hamilton, Ontario, Canada.

25-27 A.G.A. chemical, engineering and manufactured gas production conference, Hotel Sheraton, Rochester, New York.

25-29 National Fire Protection Association, annual meeting, Atlantic City, New Jersey.

27-28 PCGA distribution conference, operating section, Mar Monte Hotel, Santa Barbara, California.

30-June 5 Tenth Annual Industrial Research Conference, Columbia University, New York, New York.

June

2- 4 Appalachian Underground Corrosion Short Course, West Virginia University, Morgantown, West Virginia.

4- 5 NEGA residential sales workshop, Eastover, Lenox, Massachusetts.

9 NEGA operating division, Worcester Polytechnic Institute, Worcester, Massachusetts.

10-12 NEGA gas measurement and control school, Worcester Polytechnic Institute, Worcester, Massachusetts.

10-12 Instrument Society of America, 2nd international symposium on gas chromatography, East Lansing, Michigan.

14-18 ASME semi-annual meeting, Chase-Park Plaza Hotels, St. Louis, Missouri.

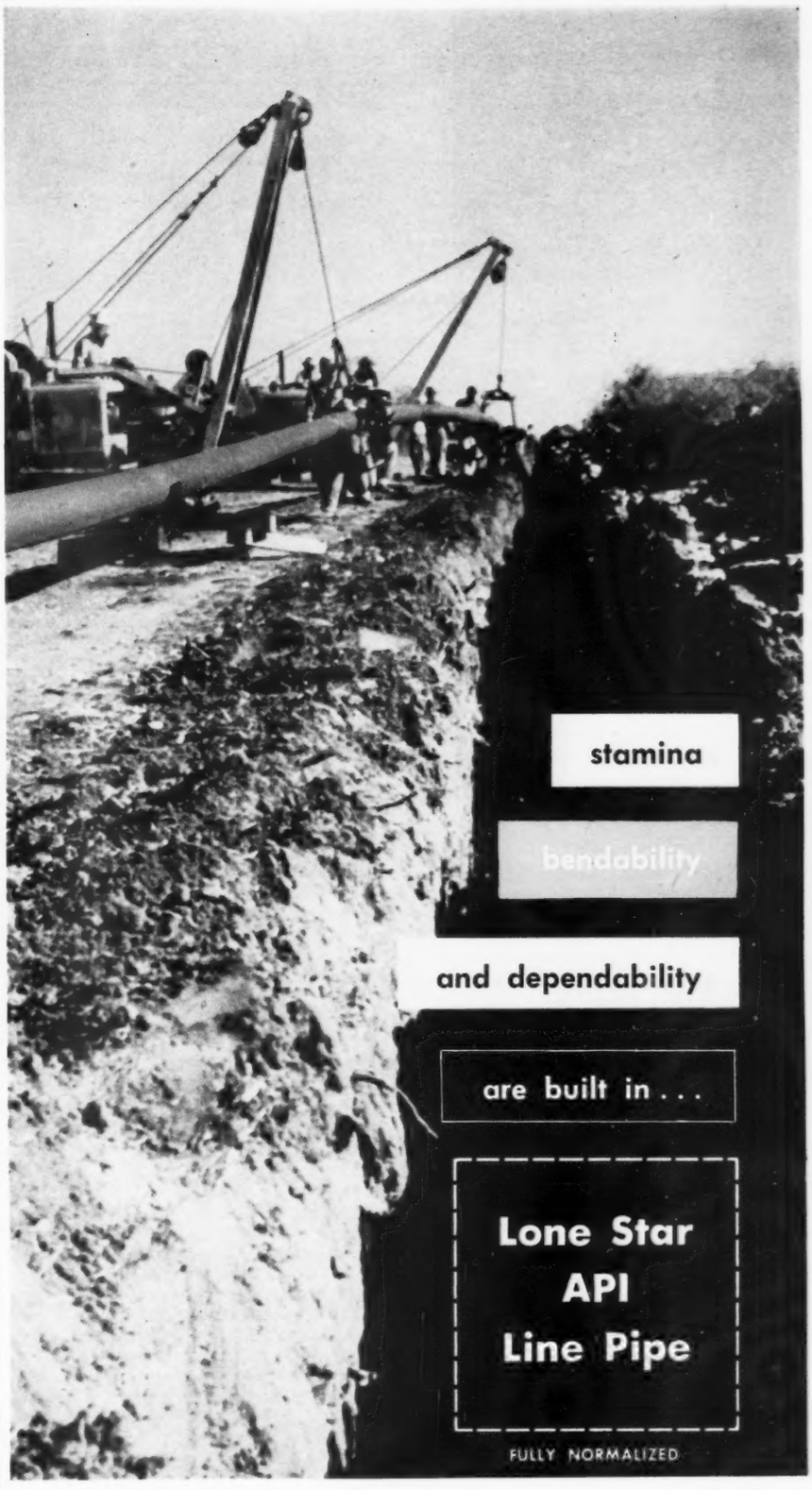
21-26 ASTM, annual meeting, Chalfonte-Haddon Hall, Atlantic City, New Jersey.

22-23 Michigan Gas Association, Grand Hotel, Mackinac Island, Michigan.

22-24 Canadian Gas Association, annual meeting, Empress Hotel, Victoria, British Columbia, Canada.

August

24-26 Appalachian Gas Measurement Short Course, University of West Virginia, Morgantown, West Virginia.



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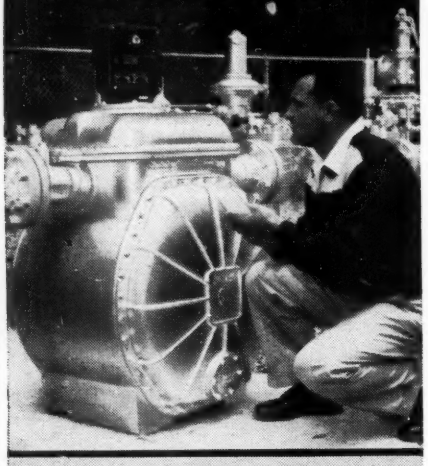

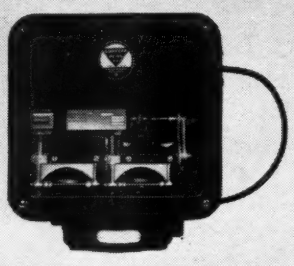

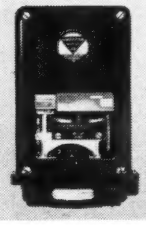

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No computations...accurate gas volumes at base conditions are shown immediately. A second counter on the back indicates volume at line conditions. Simple operating principle... integration is continuous with all functions performed mechanically through special gearing.

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MEN AT WORK

IN THE GAS DISTRIBUTION INDUSTRY

● **William I. Pell,** former manager of pipe sales for Colorado Fuel and Iron Corporation, has been appointed sales manager steel products division of Kerotest Manufacturing Company.

W. I. Pell

R. H. Koehler

● **Richard H. Koehler** has been appointed general sales manager of the Le Roi Division of Westinghouse Air Brake Company succeeding **Jack E. Heuser,** who resigned to become associated with the management consulting firm of Worden and Risberg of Philadelphia, Pennsylvania. Koehler was formerly on the staff of the president of Westinghouse Air Brake Company of Pittsburgh, Pennsylvania, where he was director of advertising and publicity.

● Newly elected officers of the Winnebago Natural Gas Corporation, Kaukauna, Wisconsin, are: **J. F. Cota,** president and general manager; **E. H. Schmidt,** vice president; **B. F. Crawford,** secretary and treasurer; **R. H. Lawrenz,** assistant treasurer; and **W. T. Rieser,** assistant secretary. Directors are: **E. H. Schmidt, B. F. Crawford, J. C. Colman, Milton Falcoff,** and **George Newlin.**

● **L. T. Potter,** president of Lone Star Gas Company, has been elected to the board of directors of Lone Star Steel Company to fill the vacancy caused last year by the death of W. C. Windsor of Tyler.

● **Herman R. Brown,** formerly western regional manager, has been appointed sales manager, "Payloader" Division of The Frank G. Hough Company. Other changes in the Hough sales organization include: **Kenneth B. Larkin,** a former district manager, has been appointed eastern regional manager; **Robert L. Knox** has been transferred from the eastern regional manager to central regional manager; **Donald O. Ross** has become western regional manager in the new organization; **Bruce C. Dennett,** formerly sales engineer, has been appointed assistant to the regional managers. **Charles J. Bernard,** manager of the order and distribution department, assumes direction of manufacturers export sales as well as scheduling operations.

● **D. M. M. Goldie** has been appointed general solicitor heading British Columbia Electric's legal division. He will report to **A. Bruce Robertson** whom he succeeds as general solicitor. Robertson, whose new title is vice president and general counsel, becomes available for special assignments from the company president and directors.

● Consolidated Natural Gas Company has announced the employment of **Lawrence L. Gray** as an attorney in its New York office.

● **Katherine L. Rathbone,** home service supervisor of Southern Counties Gas Company for the past 16 years, has retired from active gas company service after a career of over 31 years.

● **Willis A. Strauss** has been elected executive vice president of Northern Natural Gas Company. Formerly administrative vice president, Strauss will report to the president and under his direction be responsible for all operations of the company.

● **R. M. McIntyre** has been appointed to the post of manager, residential sales of Southern Counties Gas Company. McIntyre, who has been serving as market development manager, will be responsible for functional control of all residential sales activities and of market development for the company. He will report to **Burt Larson,** general sales manager.

R. M. McIntyre

E. V. McAssey

● **Edward V. McAssey** has been promoted to assistant manager of the transportation department of Consolidated Edison Company of New York. He moves up from general superintendent in charge of the equipment assignment bureau, and will be given special assignments to assist the manager, **R. O. Babcock,** in operation of the transportation department.

● **Henry P. Gatin** has been appointed manager of administrative controls for Saskatchewan Power Corporation. He has previously been on the staff of the Engineering Institute of Canada.

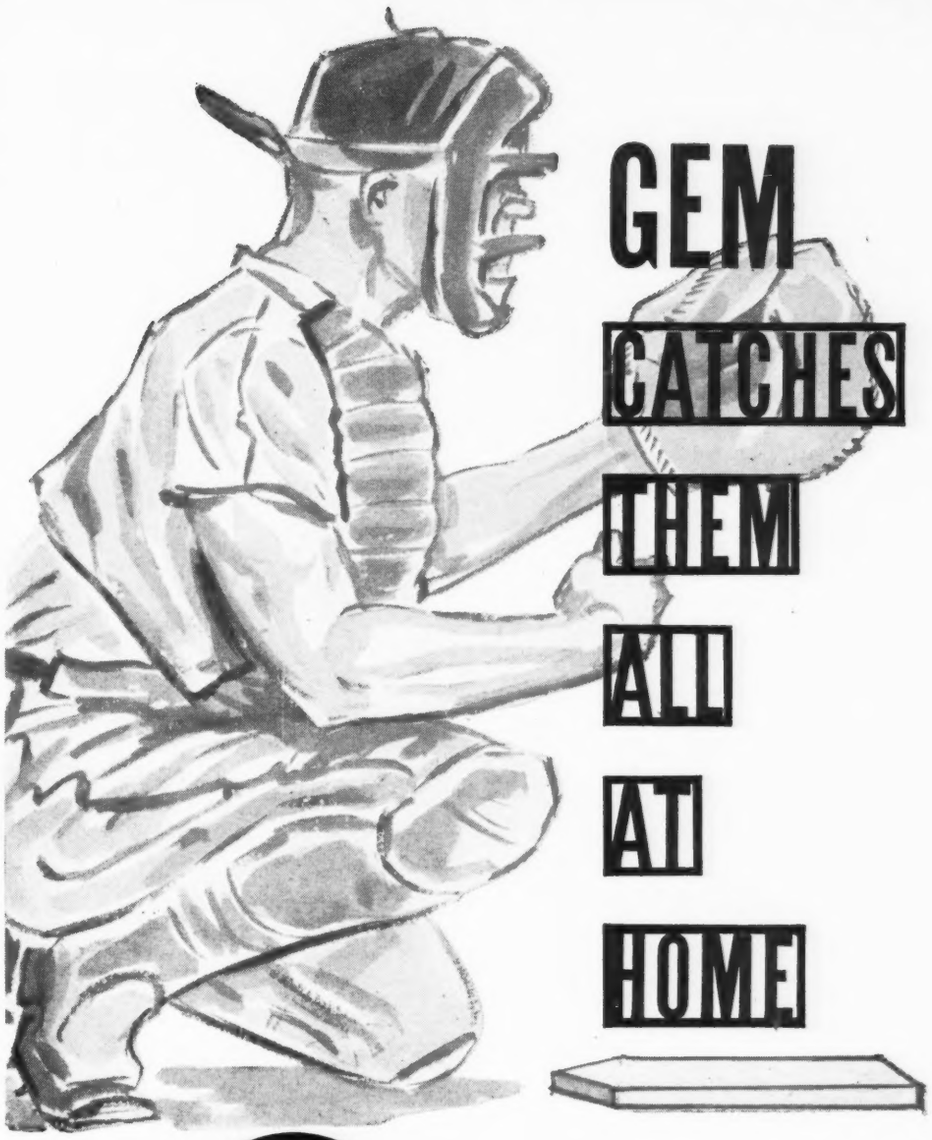
● **Wilber Hadley Mack** has been elected a member of the board of directors of American Natural Gas Company. Mack is executive vice president and general attorney of both American Louisiana Pipe Line Company and Michigan Wisconsin Pipe Line Company, subsidiaries of American Natural, vice president and secretary of American Natural Gas Production Company and general attorney of American Natural Gas Service Company.

Henry Tuttle

Henry Tuttle, 62, president of Michigan Consolidated Gas Company, died March 26 at Henry Ford Hospital in Detroit. He had been ill for five months. Tuttle started as a service man in the shop department in 1920 and became president of Michigan Consolidated, one of the nation's largest gas utilities, in 1952.

GEM price tags help sell appliances on the display floor.

See Playhouse 90 on CBS-TV.



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M. B. Skinner Co.
Sprague Meter Co.
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U. S. Pipe and Foundry Co.
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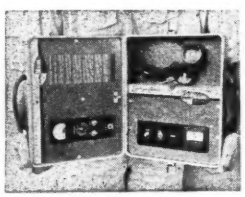

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W. A. Cook

C. R. Holloway, Jr.

● **James F. Bell** has resigned as executive vice president of Northwest Natural Gas Company. The position will not be filled but instead the duties and responsibilities of other officials have been expanded. Vice President **W. A. Cook** will now be in charge of the operating department in addition to rate and regulatory matters. Vice President **C. R. Holloway's** duties have been broadened to include the districts in addition to customer service, customers office, and sales department. **C. V. Griffith,** controller, will now also be responsible for the land and claim department. **A. O. Leech** and **C. W. Steel** have been appointed assistants to Cook and Holloway.

● Three new engineers have been added to the staff of The Gas Service Company. **Jerry F. Vinyard** and **John H. Casten** will become employees in June, and **Merrill H. Bumbaugh** joined the firm at Wichita during February. Bumbaugh previously worked as an engineering assistant for an electric utility in Michigan. Vinyard is presently a Lieutenant in the U. S. Air Force, and will be discharged in May. Casten graduates in June from Oklahoma State University at Stillwater with a degree in air conditioning and refrigeration technology.

● Recent personnel changes at the Ohio Fuel Gas Company include: Retirement of **Ray A. Norris,** Cambridge office accounting supervisor on April 1 after 31 years with Ohio Fuel. **Richard G. Darrow** has been named senior engineer in the engineering and research department of Columbia Gas System Service Corporation in New York. He was formerly senior engineer in the gas engineering department of the Service Corporation in Columbus. **Charles H. Wirth,** Columbus district business promotion manager, has been appointed to the newly created position of manager of special promotions. In addition to established promotions such as model home showings and the Mrs. America contest, Wirth has been selected to pioneer a number of new projects. **George C. Morgan,** district business promotion manager, has been promoted to a similar post in Toledo. **Miss Carolyn J. Krause,** former Fremont district home service director for Ohio Fuel, has been named Steubenville district home service director for Ohio Valley Gas Company, another subsidiary of the Columbia Gas System.

● **Chester L. May** of Dallas, Texas, has been elected a director of Rio Grande Valley Gas Company to fill the vacancy on the board resulting from the death of O. P. Wilson, former board chairman. May, a former senior vice president and director of Lone Star Gas Company, retired from that company in October, 1958.

● United Gas Improvement Company has announced several operating department changes: **W. R. Bollendorf Jr.,** formerly operating manager of the Harrisburg Gas Div., has become operating manager of the Lehigh Valley Gas Div. succeeding Henry W. Parker who died Jan. 1, 1959. **Harry R. Ottey,** former distribution superintendent in the Harrisburg Gas Div., succeeds Bollendorf as operating manager at Harrisburg. **John S. Beard,** former main and service superintendent at Reading, has transferred to the Harrisburg Gas Div. where he will be superintendent of gas supply and services. **Irving P. Cook,** former staff engineer in the Harrisburg Gas Div., has become distribution superintendent at Harrisburg. **W. L. Glessner,** former customer service superintendent of the Harrisburg Gas Div., has become staff assistant in the operating department of U.G.I. at Philadelphia. **Harry T. Maycock,** former distribution engineer at Lancaster, has moved to the Reading Gas Div. to be main and service superintendent. **Robert L. Yeager,** former production superintendent of the Harrisburg Gas Div. has transferred to the Lancaster County Gas Div. to become distribution engineer.

● **Oliver E. Owen** has been appointed chief right-of-way engineer for San Diego Gas & Electric Company succeeding **William F. Garber** who retired March 1. **Magnus Hjalmarson** has retired as superintendent of plant construction and **Conrad Hjalmarson,** formerly construction superintendent, has been appointed to succeed him.

● **Michael P. Groom** has been named branch manager of the new El Paso sales office of Rockwell Manufacturing Company's Meter and Valve Division, and **John R. Applegate** has been named branch manager of the division's Detroit sales offices.

● **Robert F. Davis** has been named to the newly created position of manager, two-way radio sales, of a 13-state Midwest area for Motorola Communications & Electronics, Inc., a sales and service subsidiary of Motorola, Inc. **Eric Goleas** succeeds Davis as regional manager in Northern Illinois, Northeastern Indiana, Eastern Wisconsin, and Michigan's Upper Peninsula.

● **John B. Wilson,** former vice president and treasurer, has been elected to the newly created office of executive vice president of Standard Pipeprotection, Inc. **Lee A. Whitney,** a vice president of Chaplin Oil & Refining Company, Ft. Worth, Texas, has been elected to the board of directors of Standard Pipeprotection.

J. B. Wilson

F. A. Mulgrew

● **Felix A. Mulgrew,** vice president of Bankers Trust Company's Public Utility Group, has been named a director of The Houston Corporation of St. Petersburg, Florida.

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Personals

● **Myron L. Unversaw** has been appointed eastern sales manager with headquarters in Indianapolis for the Amerivent Division of American Metal Products Company. Amerivent manufactures a line of double-wall gas vent pipe and fittings.

● **Frank E. Purcell** has been appointed sales manager of packaged equipment for the Unitary Equipment Division of Carrier Corporation. Formerly sales manager of the national buyer department at Carrier, Purcell will be in charge of air conditioning and heating equipment for both residential and commercial application. He succeeds **Burton T. Kohoe** who was recently appointed executive vice president of Colorado Research Corporation, a subsidiary of Carrier.

● White Rodgers Company has appointed **Robert N. Weber** to head a new product planning division recently created to guide management in future product growth. New division combines functions of several previous groups and will be responsible for research and study of possible future products, determining sales potential and marketability of new products. Weber was formerly manager of the St. Louis sales region for White Rodgers.

● **Newton E. Armstrong,** formerly product manager, control division, has been appointed manager, systems development division of Southwestern Industrial Electronics Company, a division of Dresser Industries, Inc. He is now responsible for development and production of devices, instruments, and systems for control applications.

DEARBORN STOVE COMPANY, DALLAS

REGIONAL OFFICES: DALLAS, ATLANTA, CHICAGO, LOS ANGELES, SAN FRANCISCO

● **Juel M. Ranum,** former director of public relations for Whirlpool Corporation, has been promoted to assistant to the chairman of the board, **Elisha Gray II.** In the new position, Ranum will retain his former responsibility as director of public relations but will vacate the position of assistant to the president.

● **Fred Maytag II,** president of the Maytag Company, has been elected a director of Minneapolis - Honeywell Regulator Company.

● Suburban Propane Gas Corporation has announced the following promotions: **L. H. McGuire,** from manager of operations to manager of employee relations, a newly created department; **Louis A. Katz,** from assistant to the administrative vice president to manager of operations; **Edward W. Belt,** from assistant to the controller, to regional manager; **Richard P. Jackson,** from manager of purchasing to manager in charge of product supply and traffic; **Rudolph Bruno,** from assistant purchasing manager to full responsibility for the purchasing department, and **William S. Bigelow,** from assistant to the operations manager to assistant to the controller. Also announced was he appointment of **J. D. Wynn** as assistant to the administrative vice president.

● **C. C. Drummond,** secretary and treasurer, Commonwealth Natural Gas Corporation, Richmond, Virginia, is chairman of the program committee for the Eastern Regional Conference of the Controllers Institute of America.

● Griffin Wheel Company, Chicago, a subsidiary of American Steel Foundries, has announced the following appointments to serve their new division, Griffin Pipe Division: **S. C. Prest,** vice president and general manager; **Frank Marold,** vice president-sales, and **O. L. Dean,** manager of operations. Production of cast iron pressure pipe by the Delavaud process is scheduled to start March 1960 at Griffin's Council Bluffs, Iowa, foundry. Business will be conducted from the Chicago general offices until facilities are available in Council Bluffs early this summer.

● **Floyd H. Foster** has been appointed service training instructor for the Southwest by Robertshaw-Fulton Controls Company. He will travel through the area with a mobile training school, demonstrating new types of controls. Training school will be available to representatives of utilities, appliance manufacturers, and other interested groups.

● **W. R. Lonergan** has been appointed manager of product planning and market analysis for the marketing division of Burroughs Corporation's ElectroData Division. Previously, he was manager of Burroughs' Series G program.

● Roots-Connersville Blower Division Dresser Industries, Inc., has appointed **W. L. "Bill" Nopper** as district manager of the New York sales office to supervise sales of R-C epuipment in the New York metropolitan area including Northeastern Pennsylvania, Northern New Jersey, Eastern New York State and Connecticut. **R. G. "Dick" Nancarrow** succeeds Nopper as district manager of the Philadelphia sales office. He was formerly a field engineer in the company's Chicago office.

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Slow movement saves wear • Simple seam easily sealed
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American Ductile Iron Pipe

Where deep covers and unstable bedding impose severe crushing or bending loads, AMERICAN DUCTILE Iron pipe, equipped with the standardized AMERICAN Double-X Mechanical Joint, is ideal for gas service.

AMERICAN DUCTILE Iron combines the many advantages of cast iron with increased ductility and other mechanical properties similar to those of steel. Under abnormal stresses, it may actually bend without breaking!

The inherent corrosion resistance of cast iron insures maximum long life without the expense and inconvenience of special wrappings. AMERICAN DUCTILE Iron pipe has ample wall thickness which permits tapping into the pipe wall without saddles or welding, although service connections may be easily welded on if desired.

Write now for the new illustrated brochure which shows why AMERICAN DUCTILE Iron pipe can best meet the *super-service* requirements of the gas industry. Your nearby American Cast Iron Pipe Company representative will be glad to supply full details.

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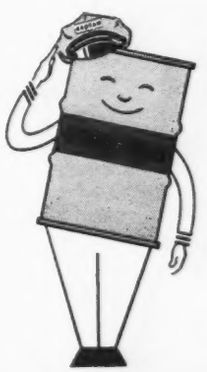
	CAPTAN	OTHER
1. 100% odorizing material *(no antifreeze diluent needed)*	✓	
2. Scientifically compounded *(for lasting uniformity)*	✓	
3. Of specially purchased ingredients *(from selected suppliers)*	✓	
4. In a special plant *(used exclusively for the production of gas odorants)*	✓	
5. Filter cleaned and dried *(to cloud point −20°F. max.)*	✓	
6. Packaged to suit your convenience*	✓	
7. Strategically warehoused for immediate delivery	✓	
8. Delivered **F.O.B. YOUR PLANT** *(our responsibility all the way)*	✓	
9. Supported by samples and laboratory reports *(retained at our plant for your further protection)*	✓	
10. Sold by odorization specialists whose only job is making regular, personal field calls to serve you.	✓	

* ½ to 1½ pound cans; extra-heavy, lined, distinctively labeled 5, 15, 55 gallon drums; the ONLY producer-owned, ICC certified mercaptan tank wagon, driven by an experienced odorant technician.



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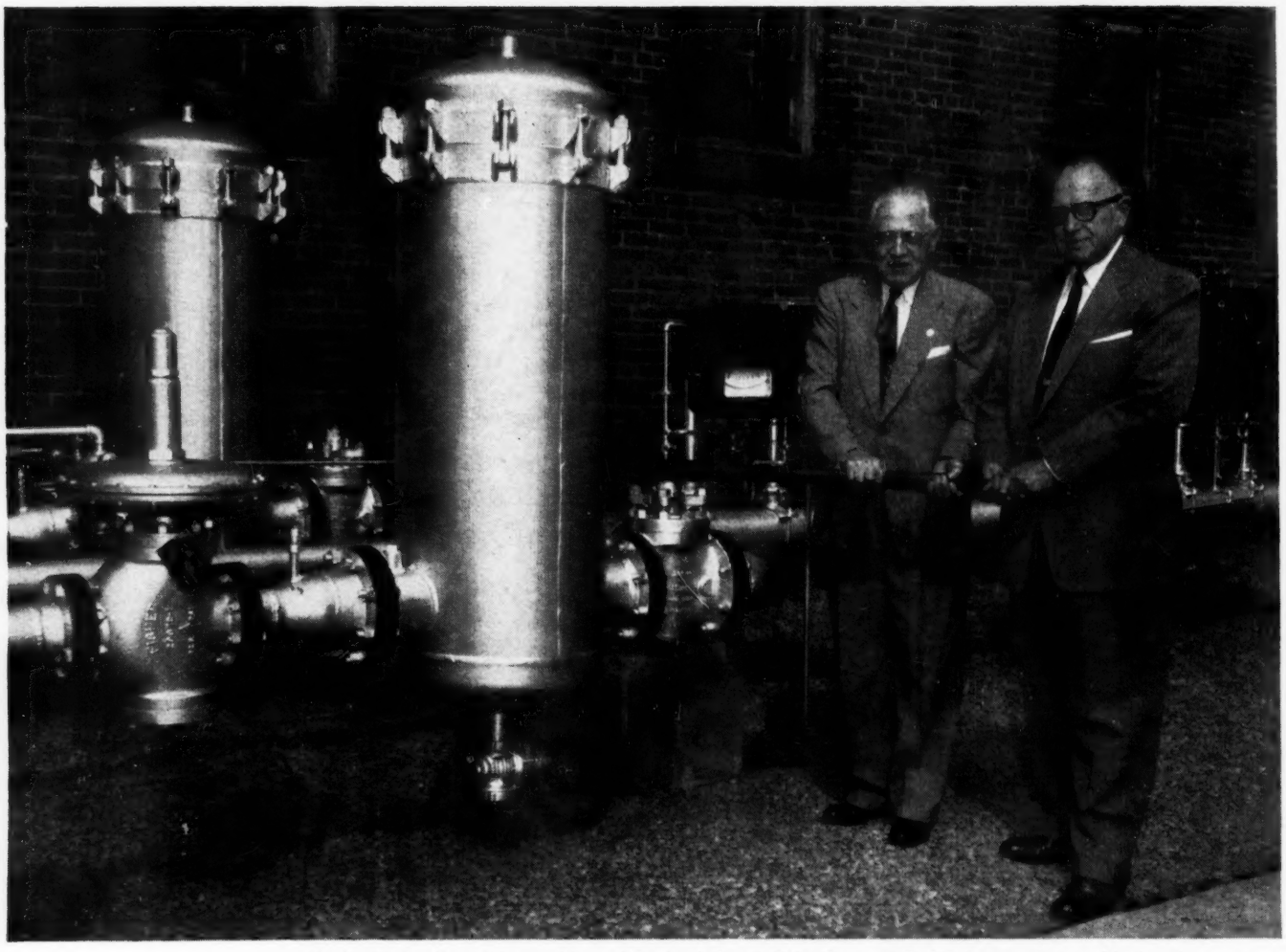

Charles H. Gueffroy, left, president of Portland Gas & Coke Co., and Carl E. Braun, vice-president and manager of Publishers Paper Co., Oregon City, Ore., "turn on the gas" at latter's plant. In foreground are two 6-inch Staynew filters, Model CPHG-10030, part of a large purchase by Portland utility.

Portland Selects Staynew Filters

for Natural Gas Piped from New Mexico

A spectacular 1,500-mile pipeline, bringing natural gas from New Mexico to Portland, Ore., promises a great new source of thermal energy to industries looking for locations, as well as savings of hundreds of thousands of dollars yearly to home gas users.

Portland Gas & Coke Co., which has been in business nearly 100 years, made a rewarding installation of Staynew filters in 1954, and, as a consequence, selected Staynew to filter much of its new supply of natural gas. Staynew filters purchased by the Portland utility in 1956 alone, it is conservatively estimated, are now filtering 25,000,000 scfd. It is also believed that more than 2,000,000 scfd are being filtered into homes by the new Staynew Model CPHB home gas filter.

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Men who know their backhoes
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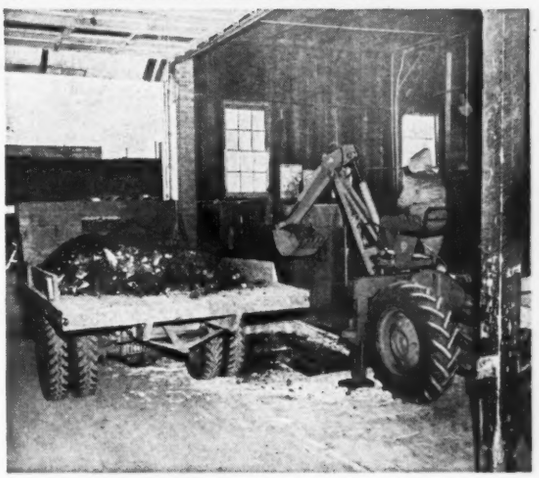
Prefer DAVIS



Operators who have to dig in congested areas – around refineries, tank yards, crowded construction sites – inside buildings or alongside existing service and flow lines prefer the Davis Backhoe.

That's because the Davis Backhoe permits unsurpassed vision, and a profit-taking "seeing-eye" helper isn't needed. The Davis also **digs flush** alongside buildings, fences, and other installations.

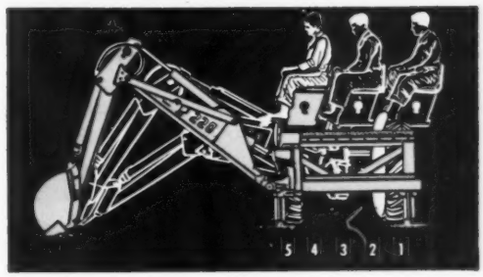
It developes up to **14,000 breakout force** to go right through frozen ground or asphalt.

No wonder, men who own this popular Backhoe make more money!

and NOW the *NEW* DAVIS 220

has HYDRA-SLIDE POSITIONING

GETS READY TO FLUSH DIG IN LESS THAN 5 MINUTES



The new Davis 220 features Hydra-Slide positioning to move the digging assembly (and the seat) to a flush digging position. It can be done in 5 minutes by simply loosening four bolts and sliding the mast assembly by actuating the boom and bucket cylinders. Total of 5 digging positions located along frame.

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Full range of crowding speeds—exclusive Barber-Greene Hydra-Crowd provides infinite range of crowding speeds . . . permits top digging capacity in all conditions.

Easier to operate—full hydraulic controls within easy reach means less operator fatigue . . . easiest steering . . . greater accuracy.

All-hydraulic spoil conveyor—10′ variable-speed conveyor loads directly into trucks . . . handles spoil at speeds to 640 fpm. Folds to 8′. Rubber impact rollers reduce belt wear, eliminate material build-up beneath belt.

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59-10-D

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8 **LOCAL AD CAMPAIGNS**—field tested—with Bryant factory and distributor participation.

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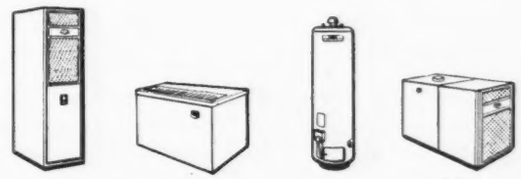
11 **GAS AIR CONDITIONING** gives you big opportunity to GROW—close tie-in with Gas Utility promotions.

12 **BRYANT'S FINANCIAL STRENGTH** protects your *future*.



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The Industry's Biggest Headache . . .

RISING COSTS

From the editor's notebook, a report on what the gas distribution industry faces and what it is doing and can do to offset the effects of inflation

OF ALL THE PROBLEMS FACING THE GAS INDUSTRY, the most puzzling, perhaps, is *what to do about rising costs.* "Each year we spend more money and, it seems, get less for what we spend," notes one gas utility executive.

Underlying the overall problem, of course, is the economic element of inflation; it forces upward the price of everything the utility buys and reduces the value of every dollar available for such purchases. Annual rate of depreciation in dollar value during the 1946-56 period was 3.7 percent *. . . compounded annually, that's the equivalent of a 50 percent rise in prices every 11 years. The trend hasn't stopped.*

How costs have risen — due to inflation — are reflected in the two accompanying tables. These "Cost Index" tables give two bases; one, the top line, is based on 1939 = 100; the second line is based on 1949 = 100. Table 1 illustrates how costs of selected materials items have risen in the past 20 years; Table 2 shows how installed costs for various distribution system components have increased in the same period.

In 1959, the gas distribution industry will spend an estimated $951,000,000 for new and replacement facilities:

. . . in 1949 dollars, this is only $598,000,000!

. . . in 1939 dollars, this is only $313,000,000!

In other words, in terms of 1949 dollars, the industry will add only $598,000,000 in new facilities, but will spend an additional $353,000,000 to cover cost increases due to inflation!

What can the gas utility do to offset these increasing costs? Three alternatives mentioned most often are *rate increases, reduce investor return,* and *reduce operating expenses.*

Rate increases are only a partial answer. The peril here is that you can raise prices too high, forcing customers to competitive energy sources, resulting in decreased sales. Not to be overlooked is the fact that rate increases are becoming increasingly more difficult to get.

Reducing return to investors is also perilous. This can result in less money for future growth, make investment in company by stockholders less attractive, and ultimately result in company having to reduce needed expansion and maintenance programs. "Like cutting your throat with a dull razor," emphasizes one utility manager.

Third alternative is to reduce operating expenses and increase productivity. Here is an area where effective measures can be taken . . . and is considered the most desirable — and, probably, the only sound way to "get more per dollar spent."

Gleaned from a well-filled notebook are some of the many ideas suggested by gas distribution men at every operating level. These are ideas worth considering . . .

Better Materials and Equipment

For mains and services, the use of such materials as plastic pipe, ductile iron pipe, and thin-wall steel pipe are well worth investigating as a means for effecting substantial savings. Why not make **service renewals** by using plastic or copper "inserts." This eliminates need for removing old services — a costly operation — by utilizing them to protect the inserts.

Effective corrosion mitigation programs can reduce future maintenance costs. There are many good materials available for coating and wrapping pipe. **Cathodic protection,** essential ingredient in the program, can help reduce or eliminate pipe damage and its subsequent leakage problem.

Various methods of **internal sealing** for older cast-iron main systems can reduce leakage and give added life to such systems at costs much lower than replacement.

Vehicles — types and usage — deserve considerable study. Several companies are using "small cars" for service work — especially where larger trucks are not really needed. **Vehicle replacement** programs are worth studying, to determine if more economical methods can be used.

Construction equipment available today does most jobs better and faster . . . criteria here should be based on unit production cost — not initial cost of the equipment item. Obsolete equipment and outdated working methods cost many companies far more than they can afford.

TABLE I

Materials and Equipment Cost Index*

(Entire United States)

Item	1939	1949	1959
Meters	100	174	276
	—	100	158
House regulators	100	181	215
	—	100	119
Cast iron pipe,	100	182	255
6-in. and over	—	100	140
Cast iron fittings,	100	201	306
4 to 24-in.	—	100	152
Steel pipe, 16-in.	100	135	203
	—	100	150
Steel pipe, 2-in.	100	158	278
	—	100	176
Compressors	100	172	273
	—	100	159

*Based on Handy-Whitman Index data (courtesy Whitman, Requardt and Associates).

Better Methods

Biggest obstacle to effective cost reduction in the gas distribution industry is **lack of standards.** We heard this from men in all phases of gas utility operations. No one proposed that all companies should conform to one set of mandatory practices and equipment design. "But we do need to have certain standards," one chief engineer emphasized. "Why not develop two or three standard meter set specifications for each type of service? Why not have certain standard design measurements for meters and regulators? Why not have standard body designs for crew and service trucks — which could save us thousands of dollars?"

"Packaged" materials for various installation assemblies eliminate wasted time in stores or warehouse departments; "waiting" time by servicemen is eliminated, and the "packages" can be assembled by stores department personnel as part of their daily routine. **Pre-fabricated piping assemblies** — such as regulator stations or large meter sets – can be done faster and easier in shops than in the field.

Paper work by field personnel often can be greatly reduced. One company found its field men spending up to one-half their working time filling out forms — more than 50 different forms were discovered. After a brief but intensive study, the company reduced this to 10 forms — only four are now used as daily reports.

Better Planning

More precise planning on new construction, replacement work, and relocation of facilities can reduce costs as much as 50 percent, another company found. At one time more than half of this utility's construction work was on a "go do it" basis; today, every job is planned far ahead, all materials are requisitioned and delivered in advance, equipment is scheduled and ready to work, and all personnel are briefed in advance on each job.

Techniques such as "cost-imating," as discussed in this issue on pages 30-33, are valuable tools in the battle against costs. Similarly, such techniques as **"free access materials,"** whereby personnel obtain certain common supplies as needed without formal requisitions, and use of punched-card inventory controls are also effective cost reducers.

To salvage or not to salvage . . . is a question also deserving much study. One company found it was selling many items that still had lots of useful life in them . . . while trying to repair and maintain other items at a cost greater than that of new replacements.

Planned preventive maintenance programs are less expensive than replacements. Key to success in such programs is scheduling such maintenance . . . to take up the slack, perhaps, between peak periods of other activities.

Better Manpower Utilization

"If you utilize the first three objectives — better materials and equipment, better methods, and better planning — you've done most of the work toward securing better manpower utilization," stated one top man with whom we discussed the overall cost-reduction question.

"Add to this proper training for each individual and develop an understanding in him of the company's problem," he added, "and you'll find your productivity will be quite satisfactory."

Training is essential for the new employee, and valuable to the man with a service pin in his lapel. Constantly changing operating conditions, new ideas in operating techniques, and the need to "keep up-to-date" necessitate that everyone from crew helper to president go to "school" occasionally.

Scheduling of available manpower in advance to meet forecasted needs is particularly valuable in construction work. **Service work** can be bolstered by having service trucks "fully equipped" with all normal supplies — replenished at night by warehousemen — so crew can go to work when the day begins. Add to this the use of dispatching via 2-way radio, making it unnecessary for crew to return "home" until end of the working day.

Effective manpower utilization also requires that all operations and job functions be studied at reasonably frequent intervals and changes in job assignments be made as needed. One company very effectively utilizes "double-duty" men; these men do construction work in the summer, service work in the winter, and in off-peak times, perform other tasks such as leak surveys, meter trade-outs, etc.

In Summary . . .

Remarked the superintendent of gas operations as he fingered his 25-year service pin, "we can't do much about the pressures of inflation. But I can tell you this — our industry is just now scratching the surface when it comes to adopting new ideas on cutting costs. We can make every job we do more challenging and rewarding if we'll just be imaginative!"

Universal application of such a philosophy throughout the gas industry just might do it.

— Dean Hale

TABLE II

Gas Distribution Construction — Installed Costs Index*

(Indexed by Areas)

Installed Item	North Atlantic States			South Atlantic States			North Central States			South Central States			Western States			Pacific Coast States		
	1939	1949	1959	1939	1949	1959	1939	1949	1959	1939	1949	1959	1939	1949	1959	1939	1949	1959
Total construction and equipment	100	197	314	100	202	324	100	190	305	100	198	309	100	187	294	100	193	308
Manufactured gas plant	—	100	159	—	100	160	—	100	160	—	100	156	—	100	157	—	100	160
Mains, cast iron	100	218	316	100	233	337	100	208	306	100	222	318	100	207	286	100	211	302
	—	100	145	—	100	145	—	100	147	—	100	143	—	100	138	—	100	143
Mains, steel	100	180	305	100	209	354	100	171	294	100	197	349	100	166	282	100	177	304
	—	100	169	—	100	169	—	100	172	—	100	177	—	100	170	—	100	172
Services	100	189	330	100	217	368	100	185	319	100	202	339	100	181	310	100	191	326
	—	100	175	—	100	169	—	100	172	—	100	168	—	100	171	—	100	171
Meter installations	100	164	284	100	165	280	100	150	261	100	155	271	100	153	277	100	161	285
	—	100	173	—	100	170	—	100	174	—	100	175	—	100	181	—	100	177
House regulator installations	100	158	267	100	166	279	100	153	266	100	168	285	100	148	256	100	158	275
	—	100	169	—	100	168	—	100	174	—	100	169	—	100	173	—	100	174
Gas labor	100	177	268	100	183	275	100	147	236	100	160	249	100	156	259	100	178	274
	—	100	152	—	100	150	—	100	160	—	100	156	—	100	166	—	100	154

*Based on Handy-Whitman Index data (courtesy Whitman, Requardt and Associates).

The Long, Hard Fight To Control Overhead Costs

Richard F. Neuschel, *Principal*
McKinsey & Company, Inc.
Management Consultants

RECENTLY I visited one of the country's largest manufacturers of weapons systems, a company that employs more than 10,000 people.

One of the interesting facts about this firm germane to this discussion is the occupational makeup of its work force. Of the more than 10,000 employees, only 30 percent are direct hourly workers — personnel actually engaged in making the company's products. Another 10 percent are indirect hourly workers — maintenance men, store keepers, etc. In contrast to these two groups, 35 percent are office employees and the remaining 25 percent represent the managerial, supervisory, sales, and professional force (including the company's engineering staff). The largest single occupational group in this company is its more than 3500 office employees.

By themselves, these are pretty sterile statistics. I was unable to put them into perspective until I took a conducted tour throughout the company's plants. During the trip through the yard alongside a main plant building, we had a chance to observe the company's shipping facilities. At one end of the building was a long shipping dock where three trucks were lined up. At the other end was a much smaller platform with one strange-looking truck. We asked our guide about these facilities, and he replied, "Oh, that small platform is where we ship our finished missiles. The larger dock is the place from which we ship the baled and shredded classified papers created in the operation of our business."

For every single missile the company ships, it creates and has to dispose of a ton and a half of paper work!

This is one of the most dramatic illustrations I have ever encountered of the blunt fact that paper work is one of the largest elements in the cost of doing business today. What's more, this element of cost is growing much more rapidly than are the nation's production workers or its sales force. Fifty years ago the ratio was one clerical worker for every 20 employees. Today, the ratio stands at one clerk for every seven workers.

Costly and Non-Productive

The problem of spiraling overhead costs is one of increasing concern to top management. As the president of one company puts it, "We've got to stop talking and start doing something about the fact that the largest and fastest growing group in our company neither produce nor sells our products."

As a result of this concern, many companies have launched some sort of an overhead-cost-reduction program in the past several years. Sometimes this is done because of a profit squeeze, a cyclical decline in sales, or an effort to gain economies implicit in a merger.

Whatever the cause, almost every company subjects itself at regular or irregular intervals to an economy-drive cathartic, or sets up some sort of staff unit to chip away continually at the high points of expense.

In spite of this widespread effort, little seems to be accomplished. I think it is safe to say that of every 10 such programs conducted, nine are unsuccessful.

Why are so many of these programs unsuccessful, and what can be done about it? There are four major roadblocks to the effective control of overhead costs:

First: The illusion that overhead costs are controlled through budgets.

Second: Failure to appreciate the savings potential in this area.

Third: Lack of hard-headed profit consciousness among most of the heads of functional segments of the business.

Fourth: Failure to tackle overhead cost reduction and control in a fundamental way.

Budgets?

Let's take a look at each of these roadblocks separately.

Most businesses of any size today have well-established systems of budgetary control. But, outside of the production area, the level of expenditures provided in a budget is essentially an arbitrary rather than "scientifically" determined amount.

In other words, the budget usually amounts to little more than a reflection of past performance eloquently defended. Stated another way, expense budgets are usually subjectively determined by the very persons for whom they serve as standards of measurement. Failure to recognize this limitation in the budgetary process is one of the obstacles that keep managements from taking more fundamental steps to achieve control of overhead costs.

Failure to Appreciate Savings Potential

The second roadblock is a widespread failure — at all levels of management — to appreciate how much pay dirt lies in this area. Most managements would be shocked at the suggestion that reductions of 20 to 25 percent — or even a third — of their overhead costs could be achieved. Most businesses have been content to achieve marginal gains in these areas.

Yet I have seen the cost of operations in purchasing departments range from $1.50 to $8 per purchase order issued; the cost of maintenance and supply stockrooms vary from $20 to $60 per 100 items disbursed; payroll function costs range from 50 cents to $3.25 per payroll check prepared, and 65 cents to $2.85 per bill prepared.

In all cases, the high cost companies have no way of knowing that they are high cost. The plain fact is that there are no cost standards for comparison and very little other knowledge throughout American business as to how many people are actually needed to run an office.

Lack of Profit Consciousness

The third obstacle — and certainly among the most formidable — is that the manager of any overhead activity does not have to show a profit on his operations. *This fact does more to inhabit hard-headed, objective thinking than any barrier that may ever confront him.*

This does not mean that the head of such an activity is a poor manager. In fact, he may be doing a conscientious, highly competent job. At the same time, he tends — as we all do — to concentrate on those parts of his job on which he is most frequently checked or judged. Because there are so few cost standards for measuring efficiency in the overhead activities that we are considering, the people who su-

pervise them are most frequently judged by the quality and speed of the service they render. It is not uncommon, therefore, to find department overstaffing to handle rush jobs or work peaks promptly and without interrupting regular routine. The supervisor usually cannot control these peaks and special demands, and his natural inclination is to be prepared for every contingency. Thus, consciously or unconsciously, he often resists any effort that might impair his flexibility for rendering this kind of service.

Lack of a Sound Approach

Final roadblock to effective cost control is that most companies fail to approach the task in a positive, fundamental way.

Too often the sporadic cost-reduction drive is either superficial and fruitless, or arbitrary and harmful. In some instances, because of management's failure to face up squarely to a difficult job, the whole cost-cutting effort is focused on such peripherial items as telephone bills, traveling expenses, memberships, subscriptions, and company automobiles.

In other instances, companies that have resorted to the "10 percent cut across the board" have learned all too often that this sort of unskilled surgery cuts away two pounds of corporate muscle for every pound of fat removed. There is ample evidence that this technique encourages even the leanest, best managed departments to acquire a layer of protective fat.

The story is much the same among companies that set up some type of staff unit to work continuously at improving overhead activities. The most common type of continuing staff effort is aimed at improving paper-work operations. Results achieved are very often limited by narrow, specialized approaches. For example, all too often, the effort to improve clerical activities begins and ends with a punched-card or electronic installation.

This approach has its roots in two illusions that are all too common throughout American business: First, that cost reduction in the office usually means office mechanization. Second, that if a given operation **can** be done on machines, then that must, *per se*, be the best way of doing it.

Yet some of the highest cost clerical operations exist in companies that use the most modern office equipment in most of their operations. Costs in these offices are not high because of mechanization, but simply because management in these offices has fallen into the trap of assuming that mechanization means efficiency and, by this process, has overlooked really big opportunities to reduce office costs.

Basic weakness of this approach is that it does not make any provision for the two primary ways for reducing overhead costs. First, there is no provision for a hard-headed, businesslike re-evaluation of what work **needs to be done** or "earns a profit" and, second, the approach does not provide for use of objective work-measurement techniques to determine how many people are really needed to do the essential work.

What Top Management Must Do

Because of these built-in obstacles, success of any large-scale program of overhead cost control usually requires something more than the ordinary effort at paving the way for change.

Specifically, top management — **and only top management —** must do two things to make this kind of a program successful. First, it must condition itself for major change. Second, it must then motivate front-line and middle management to want to achieve the desired savings goal.

Self-Conditioning of Top Management

In conditioning itself for major change, the entire top-management team must first resolve that the effort will not be just another "scrub up" of its overhead activities; instead, the company must approach the problem in a fresh, fundamental way and must be determined to achieve some very sizable overhead savings.

Second, top management must discipline itself to realize that this kind of an undertaking is not a popular thing to do, and that sizable savings simply cannot be obtained easily.

Third, if this kind of effort is to be most successful, the basic attitude of top management must reflect not just a willingness to endorse the program, but a willingness to assume responsibility for attaining worth-while results.

Motivating Down-the-Line Managers

In addition to developing this kind of understanding and cooperative attitude among its own members, top management faces an even more challenging task in making operating supervisors **want** to cut their costs instead of building them up. Here are four steps that will help achieve this goal:

1. First, provide the stimulating effect of a concrete goal by specifying in advance the size of the saving to be achieved. This helps more than any other step to divert people's attention from **whether** they will have to make changes and savings, and concentrate their attention on **how** they can best achieve the specified goals.

2. Clearly fix on line management the responsibility for results achieved. Make it clear to operating managers and supervisors that the program to be undertaken is not something that will be done to them, or for them, but one in which they have primary responsibility. They should understand that any cost-reduction task force to be set up will simply perform a spearheading, fact-finding, and coordinating role.

3. Help down-the-line managers to overcome normally defensive attitudes and to develop bold, challenging points of view in place of the typically cautious one. You can stimulate growth of this viewpoint by specifying that you are not interested in a defense of present practice or its continuation. Instead, focus attention on how quickly and how well each subordinate contributes to the over-all savings goal.

4. Finally, give real rewards and recognition for outstanding performance in achieving the defined goal. This is the only step that will insure *continuing* vitality in the cost control program. Regardless of the resolution and enthusiasm that launches such programs, down-the-line personnel will judge whether you mean what you say by the way good performance is recognized and rewarded.

These four steps are simple but not easy — simple in concept but not easy to apply consistently and well.

What Cost-Reduction Requires

To ensure success of the total effort, the cost-reduction task force members must take many steps to carry out the details of the program. One point should be highlighted — the way in which the task force must approach the job of identifying work elimination or improvement opportunities. This step is the key to the development of imaginative and productive savings ideas and, therefore, is a point of view that must be gotten across in providing leadership for the total program.

Specifically, in approaching any given area to be covered by the study, the frame of mind of the task force members should **not** be "How can I improve this operation?", "What steps can I simplify?", "How many reports can I eliminate?", etc. Rather, the line of self-questioning should take the form of a **mental forcing technique.** That is, the analyst must ask himself **"What do I have to do to cut the work load of this group by one-third?"** If you *had to cut* the manpower requirements of this group by one-third, what would be the safest or least painful way of achieving this reduction?

Acknowledgment

This article adapted from a presentation made at the 1959 A.G.A. General Management Conference. * * *

Cost-imating for gas distribution construction

Accurate, workable construction cost estimates prove valuable ally in the battle to reduce costs; here's a report on Minneapolis Gas Company's approach . . .

James H. Anderson, *Staff Engineer*
Minneapolis Gas Company,
Minneapolis, Minnesota

ONE BASIC COMMODITY is required to keep gas distribution systems expanding into new and profitable areas — **Capital.** With this capital, gas companies can purchase the materials and pay the labor force necessary to make new installations. With these new customers, and with plants in good operating condition, stockholders can be paid dividends, new capital can be attracted, and the chain of events is continued.

A darkening cloud in this growth picture, however, is **soaring distribution costs.** According to A.G.A.'s *Gas Facts*, in 1950 the value of distribution plant, industry wide, was $123 per customer. **The value of distribution plant installed during the next five years averaged $370 per customer — a 200 percent increase!** Costs are still increasing at about this same rate. It is plain to see that every effort must be made to reduce, as much as possible, the rate of this spiral.

Needed: Accurate Data for Estimating

There are any number of ways in which our costs could be controlled. A definite possibility for partial control for distribution construction is by accurately estimating costs prior to construction. This will help control the rate of increase in at least two major areas:

1. *By good construction cost estimating, companies can make more realistic appraisals concerning expansion into new communities and commercial-industrial developments.*
2. *A more agreeable inter-company liaison can be obtained between planning and operating departments because of closer coordination of monies allocated and spent.*

This article is concerned only with problems in distribution construction estimating as experienced at the Minneapolis Gas Company, and how the company worked toward the solution of these problems.

The Minneapolis Gas Company is a rapidly expanding gas distribution company, and had in its system, at the end of the 1958 construction season, some 2000 miles of mains, 184,000 services, and 214,000 meters. The company has been growing at the rate of about 90 miles of main and 6000 services each year. During 1959, it expects to install an additional 120 miles of new main and connect 10,000 new customers to its system.

As you can see, the projection of the cost of this expansion is of vital interest to us. **A 10 percent error in these costs would throw budgeted allocations off by nearly a million dollars!** We have done and are doing just about everything possible to assure an accurate basis upon which we can build policies for construction cost estimating.

Experience Is Key to Cost Data

It would be a simple matter to say that all you have to do to determine next year's cost for a certain project is to find out what a similar project cost this year, add some percentage for normal increases in labor and material, and there it is.

Basically, this is true, but:

(1) With respect to mains and larger services, seldom are two jobs exactly alike;

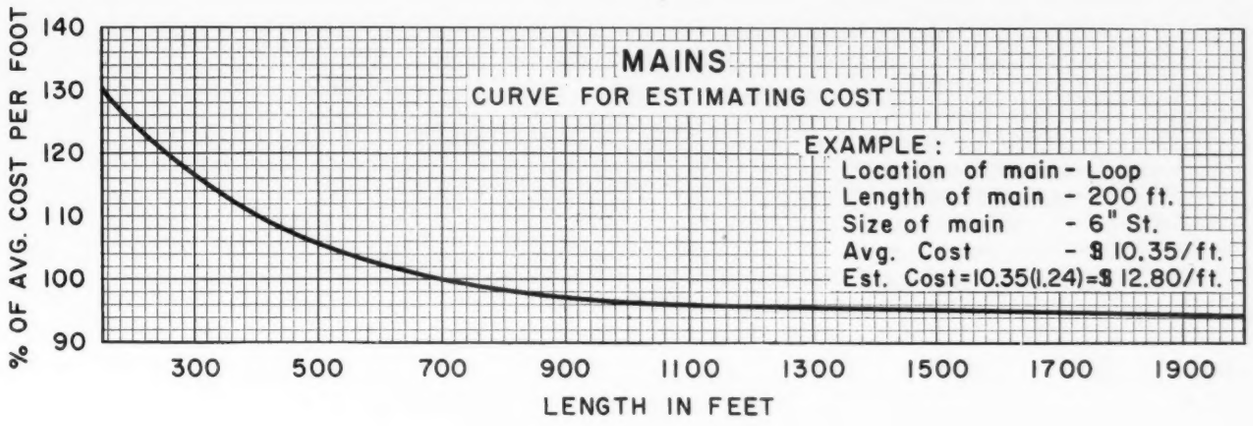
(2) If you do find two jobs that are similar enough, how do you determine this job cost? and

(3) If you do get a cost figure, are you certain that all the labor, material, and equipment costs have been included?

One thing is certain – you can't make any kind of cost projection unless you have some previous experience. Chances are, with most companies of our size, perfection will never be achieved, but certainly we can all stand improvement when it comes to allocation of construction charges.

INSTALLATION COSTS — ESTIMATING DATA

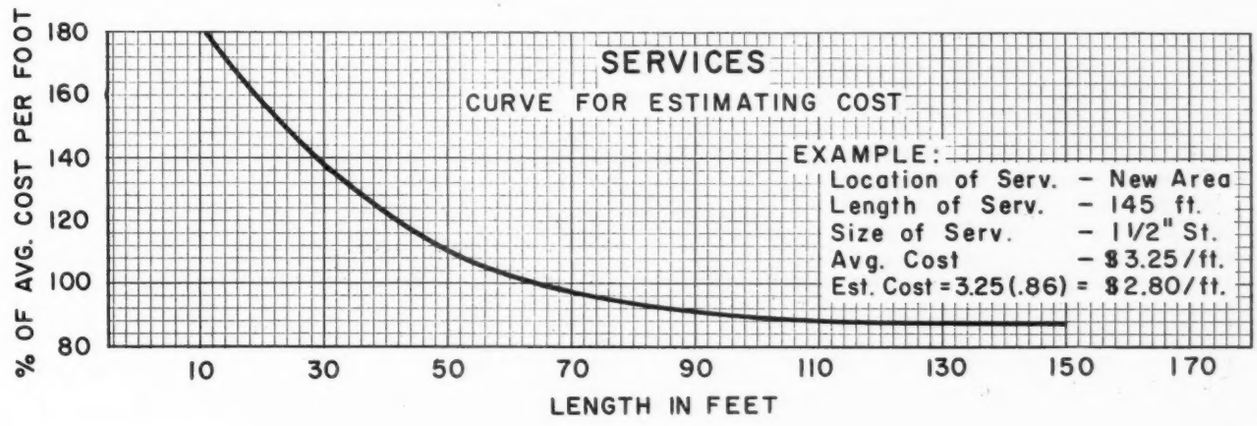
(Data for 1958)



MAINS

(Figures are cost in dollars per foot for individual installations)

	Pipe Size and Type													
	2-in. Steel	3-in. Steel	4-in. Steel	4-in. C. I.	6-in. Steel	6-in. C. I.	8-in. Steel	8-in. C. I.	10-in. Steel	10-in. C. I.	12-in. Steel	16-in. Steel	20-in. Steel	24-in. Steel
Loop area	4.75	6.20	7.65	7.70	10.35	10.50	11.50	11.70	14.50	15.00	14.95	16.85	18.00	20.75
Adjacent to loop	3.00	4.00	5.10	5.25	6.70	6.90	7.90	8.10	10.80	11.35	10.85	13.35	15.00	17.75
Outlying and suburban	2.50	3.20	3.80	3.95	5.35	5.50	6.55	6.70	9.40	9.90	9.95	12.10	14.00	16.50
Cut and replace paving	3.40	3.45	3.50	3.50	3.55	3.55	3.65	3.65	3.75	3.75	3.80	4.50	4.65	4.80
Casing	—	—	6.90	—	10.60	—	12.70	—	17.00	—	20.15	33.55	43.80	46.10
Clamp and installation	—	—	—	—	—	14.15	—	16.65	—	21.80	—	—	—	—



SERVICES

(Figures are cost in dollars per foot for individual installations)

	Pipe Size (Inches)										
	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	2	3	4	6	8
Solid paving	3.40	4.30	4.05	5.00	5.45	5.25	7.45	11.40	14.40	16.80	no extra for paving
Established street and lawn	2.60	3.15	2.75	3.80	4.55	4.35	6.55	9.10	13.20	15.20	no extra for paving
No street or lawn repair	—	1.90	—	2.55	—	3.25	4.25	6.50	9.20	10.50	—
Casing	—	—	—	—	—	.50	.60	.75	1.25	2.00	3.00

METERS — Tinned Steelcase

Size	Working Pressure	Dimensions W-D-H	Wt	Connection	½" Drop 5" MP	Capacity (cu ft per hr) 2" Drop 5½"	14"	2#	3#	14#	Cost Meter*	Inst**
5M	5" or 5½"	12 x 10 x 17	16	T½	210	—	—	—	—	—	$ 20	$ 22
10B	MP from Cl 1 or Cl 2 mains	14 x 12 x 19	23	T¾	300	—	—	—	—	—	27	25
20B		17 x 13 x 22	34	T1	450	—	—	—	—	—	55	32
30B		19 x 15 x 27	49	T1¼	600	—	—	—	—	—	85	40
11C	5" MP from	20 x 17 x 28	64	T2	1100	—	—	—	—	—	150	85
60B	Cl 1 mains only	24 x 21 x 32	88	T1½	1300	—	—	—	—	—	160	95
100B		27 x 24 x 37	147	T2	1800	—	—	—	—	—	292	140
25C		25 x 25 x 35	135	T2½	2500	—	—	—	—	—	310	180

*Storeroom cost of meter only. **Includes cost of installing both meter and regulator.

METERS — Iron or Aluminum Case

Size	Working Pressure	Dimensions W-D-H	Wt	Connections	½" Drop 5" MP	Capacity (cu ft per hr) 2" Drop 5½"	14"	2#	3#	14#	Cost Meter*	Inst**
5B	5	9 x 10 x 24	40	T1	165	—	—	—	—	—	$ 26	$ 22
10B	5	10 x 11 x 16	50	T1	250	—	—	—	—	—	30	25
10B	100	11 x 12 x 15	90	S1	250	—	—	—	—	—	90	25
25B	10	13 x 13 x 18	110	T1¼	400	900	900	915	955	—	72	50
25B	100	13 x 14 x 18	120	T1¼	400	900	900	915	955	1,370	107	50
35B	15	16 x 17 x 22	170	T1½	650	1,500	1,500	1,535	1,600	—	137	80
35B	100	16 x 15 x 22	180	T1½	650	1,500	1,500	1,535	1,600	2,360	150	80
80B	20	20 x 18 x 24	320	S2	1200	2,500	2,500	2,550	2,760	—	238	140
80B	100	19 x 18 x 26	330	S2	1200	2,500	2,500	2,550	2,760	3,860	268	140
80B	100AL	19 x 18 x 26	160	S2	1200	2,500	2,500	2,550	2,760	3,860	385	140
250B	75	23 x 26 x 31	530	S4	3000	6,000	6,000	6,150	6,430	9,200	463	245
250B	100AL	23 x 26 x 31	325	S4	3000	6,000	6,000	6,150	6,430	9,200	530	245
500B	100AL	30 x 29 x 41	—	S4	4800	10,000	10,000	10,300	10,800	15,800	862	330

*Storeroom cost of meter only. **Includes cost of installing both meter and regulator.

METERS — Rotary

Size	Working Pressure	Wt	Capacity (cu ft per hr) 2" Drop 5½"	14"	2#	3#	14#	Cost Meter*	Inst**
3½ x 10	25	335	9.1	9.3	10.2	10.8	—	$ 610	$ 390
4 x 12	25	475	12.7	12.9	14.2	15.1	—	770	400
5 x 15	25	850	23.3	23.8	26.1	27.7	—	1078	450
6 x 18	25	1125	33.4	34.0	37.5	39.7	—	1355	690
8 x 24	25	2500	60.8	62.0	68.2	72.2	—	2205	800
4 x 8	125	900	—	—	9.6	10.2	16.6	1032	425
5 x 10	125	1200	—	—	17.6	18.7	30.2	1380	475
6 x 10	125	1800	—	—	21.0	22.2	36.2	1777	705
8 x 12	125	2500	—	—	34.1	36.1	58.6	2790	825
10 x 15	125	4500	—	—	62.5	66.2	107.4	3876	1000

*Storeroom cost of meter only. **Includes cost of installing both meter and regulator.

Cost-imating is basically a three-legged table. These three legs are:

(1) A properly supervised construction force that is able to accurately indicate charges according to established internal accounts;

(2) A property evaluation department that can filter, separate, and compile these charges; and

(3) An engineering brain-trust that is able to organize these cost figures into a usable form peculiar to future needs.

When these three legs are of uniform strength and length, the table will be strong enough to carry the design load. If one of the legs is weak or missing, the other two, no matter how strong they are, will not support much weight.

At Minneapolis Gas, a unit-cost system of estimating is used. This method suits our particular requirements better than a system based on the item cost of the various components of each job. These unit charges give us an installed cost on a "per foot" or "per installation" basis for an average installation. Theoretically, this is good, but just what is an "average installation"? This average installation could vary considerably according to the individual estimator.

Consider All Factors

As a partial solution to the problem, we have bracketed our unit costs for mains and services according to several factors common to a number of installations. These cost zones are shown in the tables. Unit costs vary for a given pipe size from the costly installation constructed in the heavily travelled *Loop Area* to the less costly — but by no means cheap — suburban locations. All normal costs, such as connection charges, simple street surface repair, supervision, and engineering, are included in the basic unit cost for the area considered. If a high-type portland or asphaltic cement pavement is to be broken out and replaced, an additional charge is added to the cost per foot.

We have also tabulated additional information and costs in the tables that have been found to be of considerable value to the design and sales engineers, both in the office and in the field.

Cost Determination Methods

Briefly, our method of determining a unit cost for a given main size is as follows:

Additions to our capital accounts, as established under the uniform system of accounts for gas utilities, are con-

REGULATORS

Size	Orifice	Type	Capacity(cu. ft. per hour) at various pressure reductions*										Cost**
			35#–14#	35#–8#	5#–3#	5#–2#	5#–1#	5#–15"	5#–6"	1#–14"	1#–6"	15"–6"	
1"	1/2"	Rel 1410	—	—	—	—	—	—	800	—	—	—	$ 6
1"	1/2"	733	—	—	—	—	—	—	860	500	670	500	9
1 1/4"	9/16"	733	—	—	575	600	620	1,450	1,500*	800	980*	800*	9
1 1/2"	13/16"	730	—	—	5,400	6,000	7,000	6,600	6,500*	1,500	2,000*	1,500*	23
2"	13/16"	730	—	—	5,500	6,500	7,700	8,500	8,500*	2,500	2,700*	2,500*	34
1"	3/8"	Rel HPR	—	3,300	—	—	—	—	—	—	—	—	20
1"	1/2"	630	—	3,600	—	—	—	—	—	—	—	—	23
2"	1/2"	630	—	8,000	—	—	—	—	—	—	—	—	34
2"	11/16"	CF461	—	15,500	—	—	—	—	—	—	—	—	92
2"	1"	CF461	—	—	—	—	10,000	10,400	—	—	—	—	92
2"	1 1/8"	99–41	35,000	37,000	—	—	9,300	10,200	10,200	—	—	—	115
2"	1 1/8"	99–53	—	—	7,600	8,500	—	—	—	—	—	—	128
2"		298	109,000	109,000	23,000	27,000	31,000	33,000	34,000	—	—	—	260
3"		298	250,000	250,000	53,000	53,000	72,000	75,000	77,000	—	—	—	352
4"		298	450,000	450,000	95,000	103,000	127,000	132,000	135,000	—	—	—	416
2"		66	—	—	—	—	—	—	—	3,950	7,700	3,800	70
3"		66	—	—	—	—	—	—	—	6,500	15,300	8,700	108
4"		66	—	—	—	—	—	—	—	17,500	29,000	13,100	184

*Use 70% of capacity if not controlled downstream of meter.
**Storeroom cost of meter only.

METER HOUSES

(Includes Installation)

6'-8" x 8'-0" — $410.00	for explosion-proof lighting, add $105.00. for steam heat, add $55.00
8'-0" x 10'-8" — 585.00	for explosion-proof lighting, add $105.00. for steam heat, add $55.00

PITS

4' Diam. corrugated metal	installed complete (no piping)	$320.00
4' Diam. brick	installed complete (no piping)	450.00
5' Diam. precast concrete	installed complete (no piping)	395.00

trolled in our engineering department. This gives us a central coordination and clearing house for all departments that request expenditures which are to be capitalized.

As *Requests for Job Authorization* are received by our engineering department, installations are designed and a *job number* is designated. There are three types of *Capital Job Numbers:*

"M" numbers are used to designate mains that are to be installed within the limits of the City of Minneapolis;

"S" numbers designate mains that are to be constructed in the suburban communities surrounding Minneapolis, and

All other capital additions are designated by "E" numbers.

Blanket "E" jobs are authorized to include group expenditures of similar nature such as new and replacement residential services, small commercial-industrial services, tools and tool repairs, firm gas regulator installations, and other similar items.

A separate "E" job is made up for large commercial-industrial services and large volume meter and regulator installations.

Each year, the property evaluation department goes through a series of contortions and graphic gymnastics to separate all direct charges accrued during the year according to main sizes in the various construction zones. This gives us an average basic cost per foot of main installed. To this basic unit cost are added two cost increments:

(1) For capitalized office expenses based on payroll charges for engineering, supervision and bookkeeping; and

(2) For equipment depreciation, operation and maintenance, based on footage of main installed.

The procedure is essentially the same for determining unit costs for service installations.

Cost Variation Curves

Last year a new wrinkle was added to the cost estimating scheme. We have known all along that – even though we differentiated main and service installations by pipe size and by the area in which the installation was made — it was not realistic to assume that a 200 ft main extension would have the same unit cost as a 1000 ft extension, or that a 30 ft, 2-in. service would cost the same on a *per foot basis* as a 100 ft service, even though they were installed in the same area by the same crew.

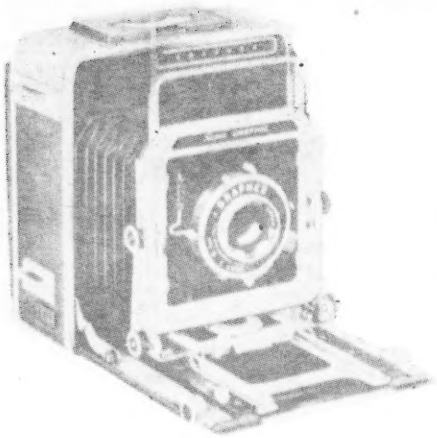
The problem was to determine the fixed charges incurred in constructing a given main or service — preconstruction field inspection, moving time, connection and purging time — and express these fixed charges in a manner that would be compatible with our unit cost system of estimating.

After nearly a year of inspections in the field, examining street department records, and going through job cost data, the cost curves on mains and services were developed. The curves are based on a percentage of the average unit cost for a given length of an installation. This system gives us a very close approximation of the actual cost that will be incurred. Two typical examples in determining the estimated cost of a main or service installation are given.

We have worked this system of estimation for only slightly over a year. Experience so far has been very good. An audit performed on 81 jobs of various lengths and pipe sizes showed a difference of only 1 percent, on the average, between the estimated and the actual cost of these installations. The maximum difference found on any one particular job was 7 percent. As far as we are concerned, this is as accurate as can be reasonably expected.

Acknowledgment

This article adapted from a presentation made at the 1959 A.G.A. Distribution Conference in Cincinnati, Ohio. * *



At Laclede Gas, photography is helping to cut costs and bring better understanding of technical problems . . .

Picture Your Problems!

John H. Betty, *Superintendent*
Service Department
Laclede Gas Company, St. Louis, Missouri

PHOTOGRAPHY IS HELPING to provide the gas distribution industry with a better way to bring an ever increasing number of technical and detailed job instructions to workmen in the field who are expected to follow such instructions in the performance of their work.

Quite often, original information, in passing through various levels of supervision, does not reach the man in the field, or else it has been subjected to such a variety of interpretations that the job is not executed in the manner or to the standard as was intended. This, obviously, results in "a job not well done."

This, in turn, causes customer dissatisfaction and reflects on the company and its personnel. Good workmanship or a job "well done," in addition to maintaining good relations with present customers and encouraging their continued patronage, also attracts new customers. Obtaining new customers and retaining old customers are the only means gas companies have to insure continual progress and, more personally, insure the job security of its employees.

With the continually increased complexity of the appliances, equipment, and just plain gadgets associated with the gas industry, we are continually faced with the elimination of the causes for a job not being well done. It is the duty of supervision and staff personnel to develop standards, methods, and procedures to this end. These, however, must be expressed in such a manner that they can be clearly understood by the field personnel or such developments have been a waste of time. Toward this end, the use of photography can be of tremendous benefit.

Photography of various kinds, from simple snapshots to involved processes of X-ray and polarized lighting, is used for many purposes and has become almost indispensable in many industrial fields in the past few years.

Of the many types of photographic equipment available, the self-developing film type camera (Polaroid) seems well adapted for the particular use of the gas distribution industry. This relatively new type of camera provides many excellent opportunities to exploit photography in the many phases of gas distribution operations. It is simple to operate and with a little practice gives professional results even to the inexperienced photographer by allowing him the opportunity to examine photographs almost immediately while on the location, thus making certain the desired quality of exposure and the subject matter are obtained.

The inexpensive box camera will also do a satisfactory job but it does not have the advantage of a rapid production of the finished photograph, which, at times, is very essential.

The old adage, "*A picture is worth a thousand words*" has certainly been proved at Laclede Gas. The primary uses of photography have been in the transmission of precise information to the man in the field with a minimum of detailed written instructions. In addition, photography has been utilized in the planning stages of the development of procedures. This eliminates to a great extent the large volume of detailed written data and expensive drawings.

Photographs are being used to study the various possibilities of standardization of installation of meters, appliances, distribution system construction, etc. Photographs are also used to record the progress of installations, to show details of installing parts on appliances, installation of complicated piping, and the quality of workmanship. All are virtually impossible to do in any other manner.

Photography has also proved to be a great time saver for supervisory personnel. They can study photographs of work in progress and completed installations without the necessity for making the many field trips that would be required. Photographs are especially useful in discussing improper installations or poor workmanship with field personnel. It is difficult for such personnel to deny the evidence as clearly shown in a photograph.

A particular category of standards developed at Laclede that was greatly expedited by the use of photography was meter installations and the resultant prepackaging of material. After considerable preplanning by standards department engineers, mock-ups of various types of meter sets were built and photographed.

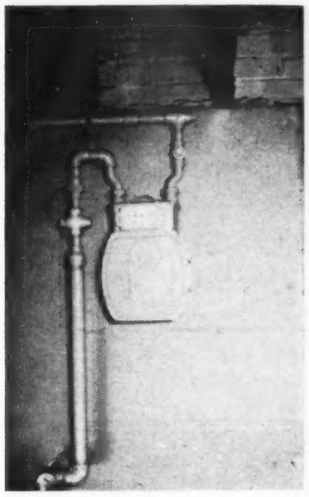
Fig. 1.

225 METER PACKAGE MATERIAL

No.	Size
3	¾" x 2" Nipples
1	¾" Insulating Union
2	¾" Pl. Ell
2	¾" Pl. Tee
2	¾" Plug
1	¾" Coupling
2	10 lt. Offset Swivels
2	10 lt. Meter Nuts
1	¾" St. Ell
1	¾" Lock Cock
1	¾" x 3" Nipple
1	¾" x 12" Nipple

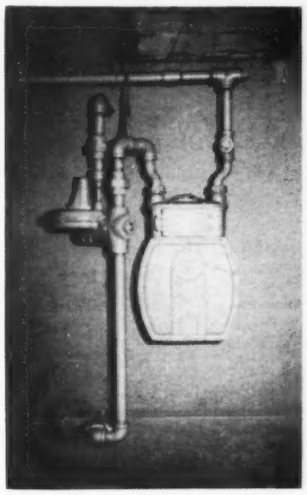
Items for risers if, as received in the packages, are not suitable interchange with material from truck.

Return excess material in packages to Storeroom.



A

225 Inside set 1¼" L.P. Service Material 225 and L.P. Riser Packages required.



B

225 Inside Set ¾" H.P. Service Material 225 and Regulator Packages required.

C

225 Outside Set ¾" H.P. Service Material 225 Package only required.

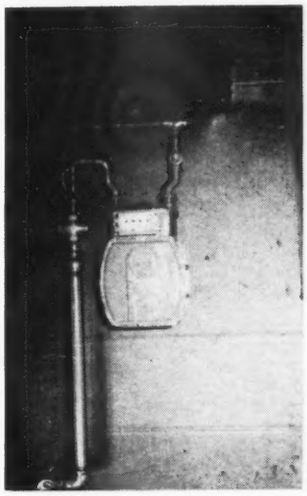
Fig. 2.

LOW PRESSURE RISER PACKAGE

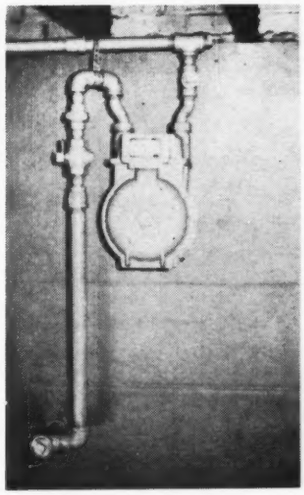
No.	Size
1	1¼" St. Ell
1	1¼" x ¾" Reducer
1	1¼" Plug
1	1¼" Tee
1	1¼" x 24" Nipple
1	¾" x 12" Nipple

Items for risers if, as received in the packages, are not suitable interchange with material from truck.

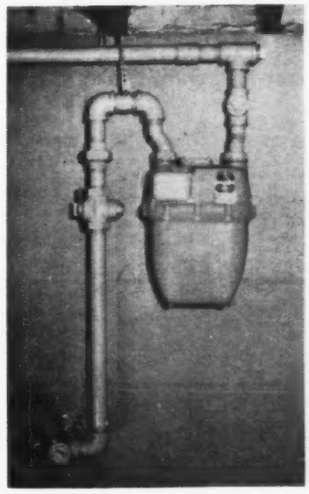
Return excess material in packages to storeroom.



225 Inside Set, 1¼" L.P. Service Material 225 and L.P. Riser Packages Required.



240 Sprague or 250 Superior Inside Set, 1¼" L.P. Service Material 240 and L.P. Riser Packages Required.



340 Superior or 415 Rockwell Inside Set, 1¼" L.P. Service Material 415 and L. P. Riser Packages Required.

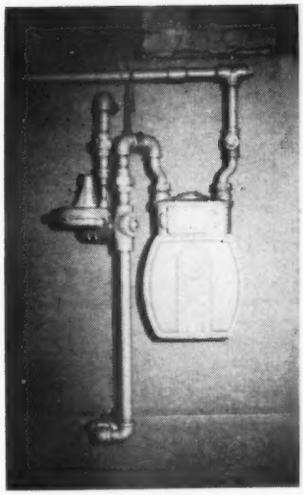
Fig. 3.

REGULATOR PACKAGE MATERIAL

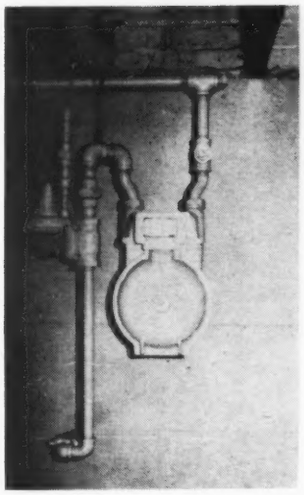
No.	Size
3	¾" St. Ell
1	¾" x ¼" Reducer
1	¼" x 2" Nipple
1	¾" x 4" Nipple
1	¾" x 12" Nipple
2	¾" x 24" Nipple
1	¾" Insulating Union
1	¾" Vent Ell
2	¾" Pl. Ell
1	¾" Coupling

Items for risers if, as received in the packages, are not suitable interchange with material from truck.

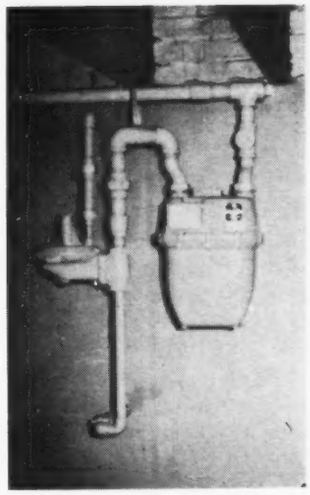
Return excess material in packages to storeroom.



225 Inside Set, ¾" H.P. Service. Material 225 and Regulator Packages Required.



240 Sprague or 250 Superior Inside Set, ¾" H.P. Service. Material 240 and Regulator Packages Required.



340 Superior or 415 Rockwell Inside Set, ¾" H. P. Service. Material 415 and Regulator Packages Required.

Study of the photographs brought about revisions and changes that were not detected in the sketching stages. The mock-ups were then rebuilt, containing the various revisions until the desired standards were accomplished.

From this point it was relatively simple to determine materials necessary for each type of meter installation. These were then packaged into units designed for the various types of meter sets.

As shown in Fig. 1, materials required for a specific series of meter sets are listed on the left side of the special gummed label under "225 Meter Package Material." Included on the label are photographs of the three basic meter sets in the 225 cu ft per hr capacity. They are:

(A) a 225 cu ft per hr capacity inside set, to be attached to a 1¼-in. low-pressure service;

(B) a 225 cu ft per hr capacity inside set, to be attached to a ¾-in. high-pressure service, and

(C) a 225 cu ft per hr capacity outside set, to be attached to a ¾-in. high-pressure service.

The instructions listed under the photographs of meter sets, types (A) and (B), show the employee that he also needs a *Low-Pressure Riser Package* (Fig. 2) for a Type (A) set, a *Regulator Package* (Fig. 3) for a Type (B) set, and no additional material is required for a Type (C) set.

This identifying label, including a list of the contents, is attached to the material package. These boxes are assembled by the stores department. The employee is furnished basic instructions for using these packages. The instructions are also included in a standards manual along with various sheets covering each type meter set. Thus, for a 225 meter, there are three standards covering all types of installations of this size meter. Standard 30.52-4, as illustrated in Fig. 4, is for a 225 cu ft per hr capacity, hard case, *inside single meter set* to be attached to a ¾-in. high pressure service. This type meter is commonly installed on domestic or residential heating loads.

Minor variations in material requirements that may be encountered on the job-site are taken care of by a minimum truck stock of various fittings.

Thus, with only a minimum of written procedures, the meter installer has the precise instructions necessary to do the job.

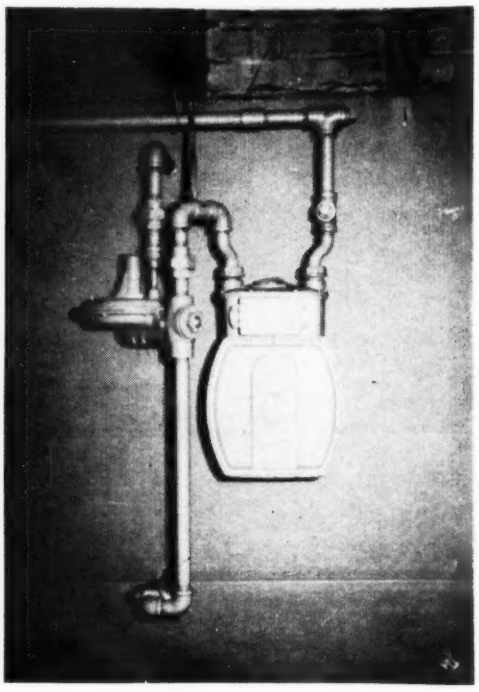
A similar set of pictorial standards is currently being developed for the installation of various appliances, including ranges, water heaters, incinerators, dryers, and refrigerators. Although Laclede does not install heating or air conditioning equipment, these two relatively complicated type installations could be very effectively described by the use of photographs.

As is the case of the meter standards, it is intended that the materials for appliance connections will also be prepackaged.

The load dispatching department at Laclede recently installed 34 new telemetric control units on the major system regulators, replacing an older type. Photographs were utilized to study the various installation possibilities from which a standard was established, as shown in Fig. 5 and 6. Reproductions of the standard photograph are used as instructions for actual installations, as shown in Fig. 7. This project, it can be appreciated, would have involved many man hours by engineers and draftsmen to accomplish what was done in a fraction of that time by the use of photography.

At present, Laclede's distribution system construction standards and procedures are being revised by the standards department. The new standards are to be photographically illustrated — instead of using detailed drawings. This is shown in Fig. 8 and 9.

5B-225 ALUMINUM INSIDE SINGLE METER SET
FROM 3/4" MEDIUM OR HIGH PRESSURE SERVICE
FOR DOMESTIC OR HEATING LOAD



The service pipe installation will terminate 4" inside the building wall with a screwed cap.

A 3/4" lock cock shall be installed on the end of the service. The 2 street ells provide means to level and plumb the assembly.

The regulator shall be installed with the diaphragm flange approximately 1" from the wall.

The meter shall be parallel to the wall with 1" clearance between the wall and back of the meter. The height of the meter shall be, when local conditions permit, 5 ft. from the centerline of the index to the floor.

When there is not sufficient room to set the meter to the right side of the service as shown, set the meter to the left side of the service (See drawing # 30.52-5).

The tee (5) at outlet swivel is for pressure test purposes.

Customer's fuel pipe and regulator vent pipe shall be properly supported.

Vent ell (29) to be at least 12" above ground line.

LACLEDE GAS CO. NO. 30.52-4	
APPROVED & ISSUED 5-2-58	DATE
DWG.	TRD.
CHKD.	
DESIGN.	
DEPT. HEAD	
SUPT. DIST.	

MATERIAL REQUIREMENTS

ITEM	STOCK	DESCRIPTION
1	28110	3/4" Lock Cock
2	27199	3/4" X 2" Nipple
3	26324	3/4" Insulating Union
4	27113	3/4" Pl. Ell
5	27418	3/4" Tee
6	27328	3/4" Plug
7	27080	3/4" Coupling
8	26752	10 Lt. Offset Swivel
9	26696	10 Lt. Meter Nut
10	-	3/4" Nipple
12	-	3/4" Nipple
20	-	3/4" Nipple
21	27122	3/4" Street Ell
22	27350	3/4" X 1/4" Reducer
23	27179	1/4" X 2" Nipple
24	27199	3/4" X 2" Nipple
25	26324	3/4" Insulating Union
26	-	3/4" Nipple
27	27113	3/4" Pl. Ell
28	-	3/4" Nipple
29	48580	3/4" Vent Ell (not shown)
31	-	Hanger Iron
		10 Lt. Meter Washers (not shown)
32	-	5B-225 Aluminum Meter
33	-	#1 M. 10,3/16", Reynolds Regulator

Items 1 through 12 available in 225 Meter Package

Items 20 through 29 available in Regulator package

Items 31 through 33 available in truck

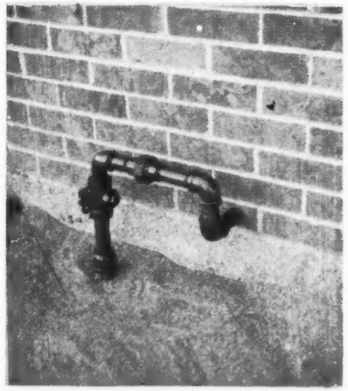
Items 10, 12, 20, 26 and 28 if, as received in the packages, are not the proper length, interchange with nipples on truck.

5B-225 ALUMINUM METER SET

Fig. 4. 5B-225 Meter, Standard 30.52-4.

SERVICE TERMINATION
METER INSIDE
1 1/4" 2" Steel Services
Low Pressure

LACLEDE GAS CO.	NO. 16.3.1 - 1
APPROVED & ISSUED	12-5-58 DATE
DWG.	TRD.
CHKD.	



Notes

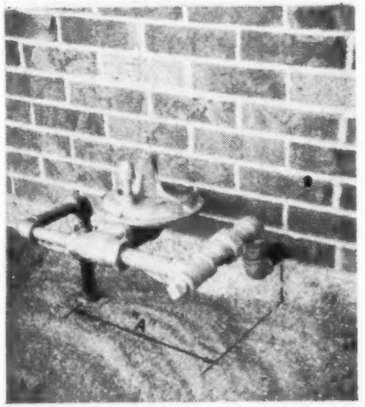
1. When entrance is through masonry, Street Dept. will install entire service including nipple and cap (Items #8 & #9). On frame entrances, Street Dept. will terminate service at cock (Item #5). The bottom of cock shall be 6" above final grade.
2. The service riser (Items #2 to #4) shall be installed plumb in all directions.
3. Elevation of nipple through wall (Item #8) shall be determined as follows:
   a. Buildings with basements and full masonry walls, install nipple on foundation.
   b. Buildings with basements and frame or veneer walls, install nipple just above sill plate.
   c. If the exposed foundation exceeds 3'-0" after grading, install nipple through foundation wall 1'-4" above final grade.
   d. Buildings without basements, install nipple 1'-0" above first floor elevation.
4. Horizontal distance from nipple (Item #8) to service riser shall be as follows:
   a. If the exposed foundation after grading exceeds 1'-4", the nipple shall be directly above the service riser.
   b. If the exposed foundation after grading is less than 1'-4", the nipple shall be offset 10" to 18" from the service riser (see picture at upper left).
5. Nipple (Item #8) shall be of such length to extend 4" to 5" inside and outside of wall.
6. All changes of direction in underground portion shall be made with lamp bends (see Item #1 below).
7. On 1 1/4" services installed to single family residences only, reduction to 1" size fittings and pipe shall be made (see Item #3). Material for this type 1 1/4" service is listed in column "A" of table below. All other 1 1/4" service installations shall be sized 1 1/4" throughout and will require use of column "B" below.

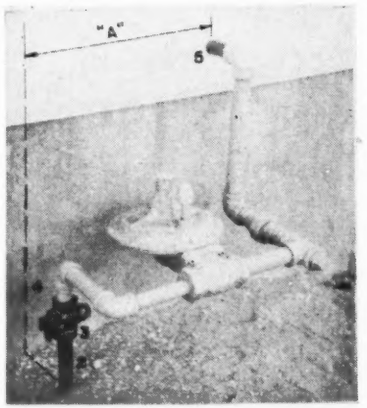
		STOCK NO.			
		1 1/4" (Note #7)		2"	
ITEM	QUAN	A	B		MATERIAL
1.	-	20334	20334	20338	Bend, Lamp, 89 1/2°
2.	-	32071	32071	32120	Pipe, Line, Coated, T/C Std. Wt.
3.	1	23362	OMIT	OMIT	Reducer, Mall., Blk., Scrd., 1 1/4" X 1"
4.	-	-	-	-	Nipple, Steel, Blk., (Length to Fit)
5.	1	28115	28155	28215	Cock, Shutoff, Scrd.
6.	1	26346	26361	26377	Union, Insulated, Blk.
7.	1	27128	21505	21560	Ell, Mall., Blk., Scrd., 90°, 150 lb.
8.	1	-	-	-	Nipple, Steel, Blk., (Length to Fit)
9.	1	20580	20583	20595	Cap, Mall., Blk., Scrd.

Fig. 8. Service termination, meter inside.

SERVICE TERMINATION
REGULATOR OUTSIDE - METER INSIDE
3/4", 1 1/4", 2" Steel Services
Medium and High Pressure

LACLEDE GAS CO.	NO. 16.3.1 - 2
APPROVED & ISSUED	12-5-58 DATE
DWG.	TRD.
CHKD.	





Notes

1. Street Dept. will install service from main to shutoff cock and plug (Items #3 and #4). Bottom of cock will be 6" above final grade. Street Dept. will also install nipple through wall on masonry walls
2. The service riser (Item #2) shall be installed plumb in all directions.
3. Elevation of nipple through wall (Item #5) shall be determined as follows:
   (a) For buildings with basements and full masonry walls, install nipple on foundation.
   (b) For buildings with basements and frame or veneer walls, install nipple just above sill plate.
   (c) If the exposed foundation exceeds 3'-0" after grading, install nipple through foundation wall 1'-0" above final grade.
   (d) For buildings without basements, install nipple 1'-0" above first floor elevation.
4. Horizontal distance from nipple (Item #5) to service riser (Item #2) shall be as follows unless otherwise specified on service pipe order. (Form 610).

Service Size	Dimension "A"
3/4"	8" to 16"
1-1/4"	12" to 20"
2"	16" to 24"

5. Nipple (Item #5) shall be of such length to extend 4" to 5" inside and outside of wall. Install size nipple indicated in table at lower right unless otherwise specified on service pipe order (Form 610).
6. All changes of direction in underground portion shall be made with lamp bends (See Item #1 below).

		STOCK NO.			
ITEM	QUAN.	3/4"	1 1/4"	2"	MATERIAL
1	-	20331	20334	20338	Bend, lamp, 89 1/2°
2	-	32041	32071	32120	Pipe, line, coated, T/C
3	1	28110	28155	28215	Cock, shutoff, screwed
4	1	27328	23154	23163	Plug, C.I., screwed
5	1				See table at right.

ITEM #5 Nipple, blk., std. Wt.	
Service Size	Nipple Size
3/4"	1"
1 1/4"	2"
2"	2"

Fig. 9. Service termination, regulator outside, meter inside.

This will not only aid in the preparation of the standards, but will make them more readily understood by the construction crews, who frequently experience difficulty in visualizing drawings and written explanations in the form of actual material and practices.

To improve the quality of workmanship produced in the field, Laclede has initiated a new system of quality control by photographing various completed installations, including all sizes of meter sets and all types of appliances. This furnishes an excellent way to evaluate the finished product and provides a control for obtaining uniform results.

Any indications of poor workmanship or failure to follow instructions are quickly detected. Correcting problems with the individuals involved is relatively simple when a photograph is available for comparison with the standard.

By having available for supervisory review and discussion field reports that contain photographs of the installations, top supervision is assured of having easily understood information that can be channeled through the various subordinate supervisory levels. The latter can utilize the reports and photographs to correct poor practices by employees in the field.

The use of photographs — or slides made from photographs — furnishes an excellent media for conducting staff and employee conferences. These can be made of any subject matter to cover all phases of the service department operations, such as introduction of new appliances and controls, proper use of tools, driver training, housekeeping, safety, general company educational subjects, etc.

Slides and photographs containing actual examples familiar to the personnel help hold interest and attention and are of substantial aid in producing trained employees.

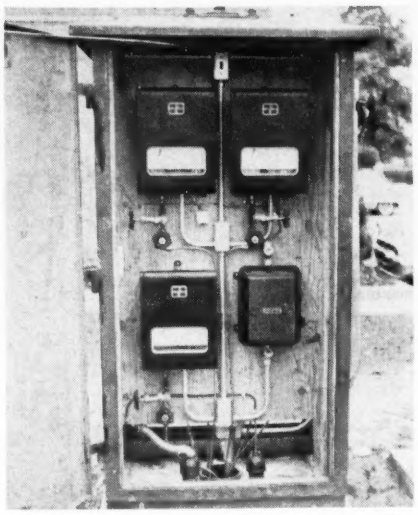
The gas industry must always be on the alert to improve the ways for detecting and correcting operational problems. It also must constantly seek ways of reducing costs and, at the same time, improve the quality of its service.

Photography can help do the job.

Acknowledgment

This article prepared from a presentation made at the 1959 American Gas Association Distribution Conference, Cincinnati, Ohio.

* * *



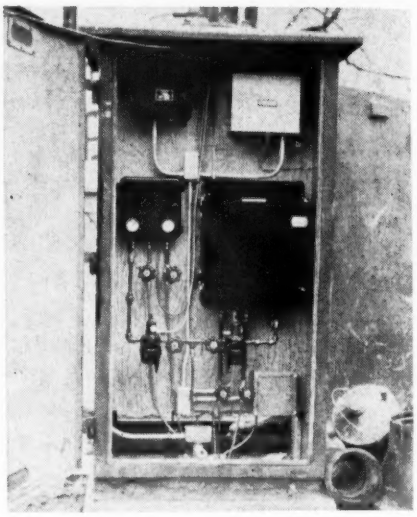
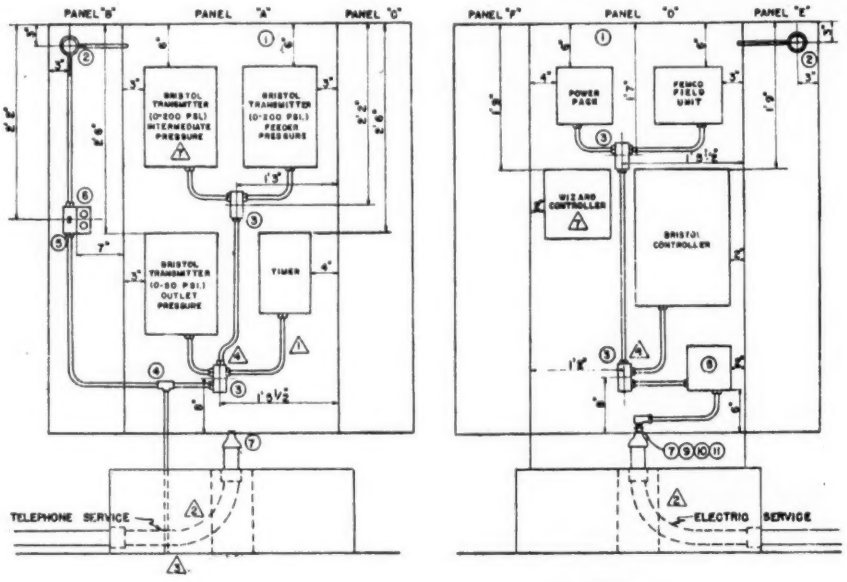


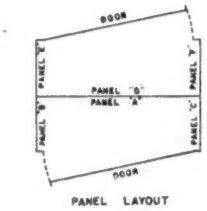
Fig. 5. (left) Panel "A" of telemetric control cabinet. **Fig. 6.** (right) Panel "D" of telemetric control cabinet. **Fig. 7.** (below) Regulator station electrical wiring. Note how photos (above) were used to develop standard installation diagram (below).

REGULATOR STATION ELECTRICAL WIRING

INSTRUMENT AND CONDUIT INSTALLATION FOR REMOTE CONTROL

LACLEDE GAS CO. NO.	17.3.1-1		
APPROVED & ISSUED			2-6-59 DATE
DWG.	M.J.M.	TRD.	W.W.W.
CHKD.	E.W.H.	R.C.J.	





PANEL LAYOUT

MATERIAL

1	SIGNAL CASE C-130
2	SIGNAL CASE LIGHT
3	HANDY BOX WITH COVER
4	CONDUIT TEE TB 17
5	S.P. MERCURY SWITCH
6	DOUBLE OUTLET RECEPTACLE
7	2"x¾" REDUCER
8	FUSE BOX, 2 CIRCUIT
9	¾"x ½" BUSHING
10	½" OBROUND ELBOW, TYPE LB
11	½" x CLOSE NIPPLE

NOTES

1. ALL CONDUIT TO BE ½" THINWALL GALVANIZED.
2. ELECTRIC AND TELEPHONE SERVICE ENTRANCES TO BE CAST IN CONCRETE SIGNAL CASE FOUNDATION (STANDARD #17.5.2-1).
3. CONDUIT FOR VAULT LIGHTS TO BE CAST IN CONCRETE VAULT ROOF (STANDARD #17.4.1-1). CONDUIT FROM SIGNAL CASE SHALL BE RUN TO NEAREST VAULT LIGHT BASE.
4. HANDY BOXES ON LOWER "A" AND LOWER "D" PANELS TO BE CONNECTED WITH ½" x CLOSE NIPPLE.
5. SEE STANDARDS #17.3.1-2&3 FOR ELECTRIC AND TELEPHONE WIRING DIAGRAMS.
6. SEE STANDARD #17.2.1-1 (OR #17.2.2-1) FOR ARRANGEMENT OF GAS CONTROL PIPING IN SIGNAL CASE.
7. INSTRUMENTS AND CONDUIT SHALL BE INSTALLED AS SHOWN FOR FEEDER PRESSURE TO MEDIUM OR HIGH PRESSURE REGULATOR STATION. FOR INDUSTRIAL FEEDER PRESSURE TO MEDIUM OR HIGH PRESSURE APPLICATION, ELIMINATE INTERMEDIATE PRESSURE TRANSMITTER, WIZARD CONTROLLER AND CONNECTING CONDUIT.

REFERENCE DRAWINGS FOR DETAILS	DWG. NO.
CONTROL PIPING INSTALLATION	17.2.1-1
CONSTRUCTION OF 6'x16' VAULT	17.4.1-1
SIGNAL CASE INSTALLATION	17.5.2-1
WIRING DIAGRAMS	17.3.1-2&3

CASE HISTORY

Company: Philadelphia Electric

Problem: Leaking Gas

Probable Cause: Leaking joints on 43-year-old C.I. main

Solution: Internal Sealing of Joints By New Method

The Philadelphia Story

Internal sealing proves itself as effective control method

J. L. Peters, *Engineer*
Gas Distribution Department
Philadelphia Electric Company
Philadelphia, Pennsylvania

THE PHILADELPHIA ELECTRIC COMPANY has a 5 psig, 8-in. cast iron main that was installed in 1914. The joints are bell and spigot type and were made up with a layer of jute, a layer of cement, another layer of jute, and a finish layer of cement.

Leaks first developed on the main in 1929, at which time leak clamps were installed. Development of leakage on this main is best indicated by the following table:

Year	No. of Leak Clamps Installed
1929	105
1934	70
1935	45
1937	21
1945	42*

*Three of these replaced clamps that were installed in 1929.

In February 1957, escaping gas was suspected, so an investigation was made and *Gas-Scope* readings confirmed the presence of gas.

During the first week of March, 1957, fill pipes were installed and the application of a "wetting agent" was started. Between March, 1957, and July, 1957, while the "wetting agent" was being used, periodic tests were made to determine the effectiveness of this method.

By mid-July, there had been no noticeable decrease in the leakage and it became obvious that another means must be used to correct this leakage. It was also felt that a more detailed study should be made to determine the extent of this leakage. During July, bar holes were made over every other joint (every 24 ft) and readings were taken with a *Gas-Scope*.

Results of this survey made it apparent that approximately one mile of this 8-in. main was leaking to such an extent that immediate corrective measures were necessary. Although the clamps had been installed some 30 years ago, it was particularly discouraging to find that leakage was found where the main had been clamped. We were now faced with making the decision as to how to correct this leakage.

Available Methods to Correct Leakage

To arrive at a solution to correct the leakage, four methods were given consideration. Actually, as discussed below, the first of these had previously been applied to this main without satisfactory results.

a. Wetting Agents to Revive the Jute. At the present time it is a general practice at Philadelphia Electric to use this method as the first approach to stop joint leakage. Based on actual field tests, the results obtained by this method have been inconsistent. On some lines treated, leakage had been slowed considerably or completely stopped. On other lines, there has been no apparent change in the leakage.

As previously discussed, filling pipes were installed on this main and a "wetting agent" application was started in March, 1957. The application was carried out in accordance with the manufacturer's specification; by the latter part of July, however, tests indicated no change in the leakage. The application of the "wetting agent" was stopped on July 27, 1957.

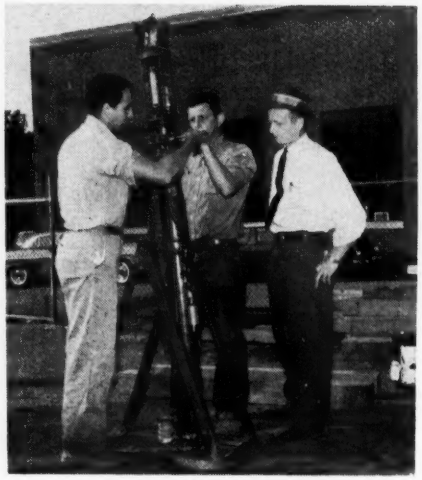
b. Leak Clamps. Installation of leak clamps has been in the past, and still is, accepted as a satisfactory method of stopping joint leakage. Increasing paving costs, however, have raised a question as to the desirability of this method, particularly where mains are under paving. Also, some concern has been shown over the fact that joints previously clamped were found to be leaking. These leaking clamps were installed prior to 1940. In some instances the leakage was due to faulty workmanship during installations; in other cases, however, no apparent reason for the leakage could be found.

In spite of this concern, there is reason to believe that clamps more recently installed and those being installed at the present time, should not develop leaks. This is due to the fact that the construction of the clamp itself has been improved by the manufacturer. Also, the method of installation has been improved considerably.

In the past it was necessary to clean the face of the bell and the spigot adjacent to the bell, by hand, using a hammer and chisel, file, and wire brush. Using this method, it was difficult to get the required area completely clean, particularly on the underneath side of the pipe. This cleaning operation is now performed with sand blasting equipment and pneumatic chisels, resulting in a much cleaner bell and spigot, even in the hard to reach areas.

In considering leak clamps on this job, various facts had to be taken into consideration. The main was located some nine feet north of the south curb or directly in the east bound traffic lane, thus presenting a traffic problem. The roadway is constructed of 10-in. reinforced concrete, which creates high excavation costs. The cost to replace this 10-in. reinforced concrete paving is high, accentuated by the fact that where paving was removed to within four feet of a seam, we were required

Coating Compound is loaded into coating machine.



Head and coating paddle are installed on coating machine.

Coating machine is installed in the main for demonstration. Control panel box can be seen on ground.

by the state highway department to remove and replace the paving to the seam.

There was also a public relations problem involved. During the winter and spring of 1957, a considerable amount of utility construction had taken place on this same road. The local residents and businessmen had become quite disturbed over this work and the inevitable slow-down of traffic on this heavily traveled road had been a problem. The local newspaper had carried several uncomplimentary front page stories regarding this construction.

In view of this, we did not relish the thought of making an opening every 12 ft for approximately one mile, which would take an estimated three months to complete. The following estimate per clamp was made:

Excavation and preparing the main	$ 30.00
Cost of leak clamp	11.00
Repaving (3 sq. yds. for each)	75.00
Total	**$116.00**
Per foot of main	*$ 9.67*

c. New Main. Installation of a new main had a great deal of merit. Other utility facilities plus sidewalk for the entire length made it impractical to consider the installation of a new main out of paving on the south side. On the north side, however, the area out of paving between the curb and property line was not occupied and there was no sidewalk for the entire length. There was the disadvantage of crossing the roadway with two 4-in. lateral mains, one 2-in. lateral main, one 2-in. service, and seven 1¼-in. services. With main construction, as with leak clamps, there was also the possibility of adverse public relations. Based on current estimating costs, the overall cost of new main, including transfer of lateral mains and services, and paving was $9.22 per foot.

d. Internal Sealing. While discussing the pros and cons of the other three methods, the question of internal sealing was raised.

Although this method had never been used on our system, we were familiar with several successful applications of the method. We also had the American Gas Association Proceedings, DMC-56-10, entitled *"Experimental Work in the Use of Internal and External Sealing Methods"* by Donald E. Barthel, Consumers Power Company, Flint, Michigan.

From a study of this report, it was decided that four requirements should be met for the internal sealing to be competitive with the other methods under discussion. These four (4) requirements were:

a) The section to be treated should have a two-way feed to prevent long jumper by-passes;

b) The number of services and lateral mains off this main should be at a minimum as sections of the line had to be shut down for an extended time period;

c) The main should be located under paving, since, generally speaking, clamps could be installed out of paving at a lesser cost than internal sealing;

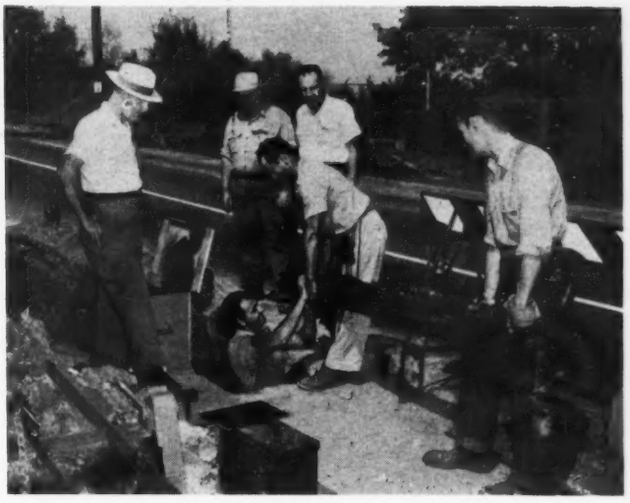
d) The main to be treated should not have offsets, bends, or short radius curves. This would interfere with the insertion of the equipment into the main.

The main met these four requirements and this seemed an ideal location to try the internal sealing method.

A contractor equipped to do this work was obtained and the following agreed upon:

1. The contractor would supply the cleaning and coating machinery and associated equipment, with an operator. Work would be performed on a unit cost basis.
2. Philadelphia Electric Company would supply or perform the following:
   a. Three men to assist the operator with the contractor's equipment.
   b. One air compressor with a capacity of 105 cu ft per min.
   c. ¾-in. steel pipe (approximately 300 ft to advance the machinery into the main.
   d. Make all necessary excavations and perform other work required to prepare the main for treatment.
   e. Obtain necessary permits and restore paving.
3. In order to install the coating equipment, an 8-ft section of main had to be cut out. The opening required at this cut-out would be 20 ft in length, with a width of 2 ft for a 5 ft length on either end and a width of 4 ft for the middle 10 ft.
4. These cut-outs should be located approximately 600 ft apart. This would permit treating the main approximately 300 ft in each direction.
5. It was recommended by the contractor that gas, at 5 psig, should not be introduced into a section of main until 12 to 16 hours after the joints had been coated. This would permit the Thiokol coating compound to cure. Using an estimate of coating 300 ft in one day, a section would be out of service for 36 to 48 hours. This is based on one-half day for shutting down the main and preparing it for coating, two days for coating and one-half day to "gas out" the main. It was therefore necessary to supply customers in the section with gas, from a by-pass, or convert the customers' appliances and supply them with bottled L.P. gas.
6. The question as to the internal

Coating paddles apply coating compound during demonstration.



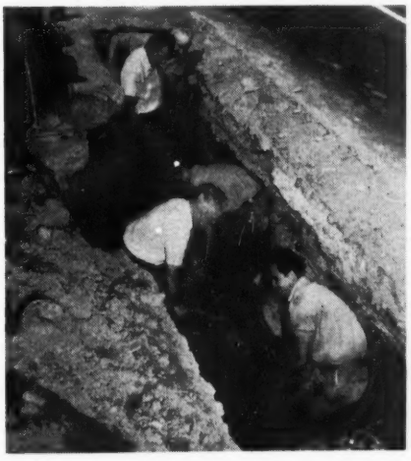
Coating machine is lowered into opening to begin coating operation.

condition of the main was raised. Naturally, when gummy tars and other foreign matter were present, the cleaning operation would be more difficult. Also where mains had been treated with wetting agents, such as this one had, the area had to be coated had to be made dry, to insure a good bond between the main and coating compound. All the drips blew dry and we felt reasonably certain this main was clean and dry.

We now had a more thorough understanding of the internal sealing method and we arrived at an estimate of $27,850.00 or $5.53 per ft. In addition to this lower cost, it was felt that the work could be completed within 3 to 4 weeks, and our public relations problem would be considerably less.

The table at top of next column compares the four methods under consideration.

Based on these estimates and an overall study of the methods, it was decided to use the internal sealing method.



Coating machine is inserted into main. Control cable can be seen at upper left.

Method	Cost per ft.	Required Time
Wetting Agent	Previously tried with no success.	
Leak Clamps	$9.67	3 Mos. Adverse public relations
New Main	$9.22	1.5 Mo. Adverse public relations
Internal Sealing	$5.53	1 Mo. Minimum of adverse public relations

How Internal Sealing Works

There are three basic operations in this method — the squeegee, the cleaning, and the coating. All three of these operations require the use of a standard length of ¾-in. service pipe threaded on each end. Quick couplings, similar to those used to connect air powered tools to air compressor hose, are placed on the ends of this pipe. The pipe is then used to advance the equipment into the main, one length being easily and quickly coupled to the next as the equipment is advanced to the center of the section. The work is performed as the equipment is pulled back out.

A set of wheels, mounted on a collar, is placed on each length of pipe to reduce friction and guide the equipment through the center of the main. With the squeegee, no air is required; with the cleaning and coating equipment, however, air is necessary to power this equipment. The air supply is provided by attaching an air hose to the end of the ¾-in. pipe, thus the pipe not only offers a means to advance the machinery into the main, but also supplies air to the machinery. A lever handle type valve is placed in the air hose where it connects to the pipe, giving the operator control of the air supply.

The various operations performed by the cleaning and coating machinery are actuated by means of an electric control cable which is connected from the machine to a control panel. This cable advances into the main with the machine.

Squeegee Operation

The first operation, the squeegee, is performed to remove foreign matter such as rust, scale, and dust, from the main. The squeegee is made up of two or three circular discs spaced several inches apart and attached to a shaft that runs through the center of these discs.

The discs are made from a heavy fabric material similar to belting material. The shape of the disc is not fully expanded, and it resembles an umbrella that is less than completely opened. The shaft is coupled to the ¾-in. pipe and the squeegee advanced into the main. As the squeegee is pulled out, the friction of the disc against the wall of the pipe, tends to expand the discs to their full circular shape, causing a drag against the pipe wall. Thus, foreign matter in the main is pulled out ahead of the disc.

Cleaning Operation

The cleaning machine is in the shape of a cylinder with wire cleaning brushes located at the front end and a "joint finder" at the rear. As the machine is backed out of the main the joint finder locates the joints electrically, to the discontinuity of the metal at the joint.

As the "joint finder" passes over a joint, it causes a needle on the control panel to deflect, with the point of maximum deflection indicating the center of the joint. Since the distance between the "joint finder" and the wire cleaning brushes is known, the machine can be backed out this distance and the brushes are then centered over the

Demonstration of cleaning machine. Note man using rocker arm to move machine over area to be cleaned.

Control panel is observed during coating operation.

center of the joint. The "joint finder" can accurately locate a joint to within a fraction of an inch.

The brushes are then rotated at a high rate of speed. While the brushes are rotating, the machine is rocked back and forth approximately 5-in. in each direction, providing a clean section of pipe 10-in. long. Air is then blown against this area to remove scale cleaned off the pipe wall. The machine is then backed out until the next joint is located.

Coating Operation

The coating machine is also in the shape of a cylinder with applicator peddles located at the front and a "joint finder" at the rear. The joints are located for coating in the same manner as in the cleaning operation. Two small cylinders are contained within the machine, providing a means for storing the base material and the catalyst that make up the Thiokol.

When the applicator paddles are centered over the joint, the machine operation is started. First, the machine is locked in place by means of a pin forced against the main by air pressure. Measured amounts of the base material and catalyst pass then through a mixing nozzle onto the paddles, which are rotating. The paddles are also being pressured against the wall of the main, causing the sealant to be forced into the voids of the joint. The pressure holding the paddles is then released and the paddles move away from the wall of the main. The paddles are then rotated until a coating of approximately ⅛-in. is built up on the wall of the pipe.

Planning the Sealing Operation

Before the actual sealing operation was started, it was necessary to make certain of preliminary preparations and plan a tentative schedule. We arranged for a crew to start on the job September 9, 1957.

The first step was to determine the location of the openings to be made. Several factors governed this decision. First, the openings should be a maximum of 600 ft apart, allowing us to work from each end of a section for a maximum distance of 300 ft. This maximum distance is arbitrary, because the weight of the machine and ¾-in. pipe, when extended much beyond this distance, makes movement rather difficult.

Due to field conditions, there were sections on this job greater than this maximum, but these sections were treated with little or no difficulty. And, because the equipment could not pass through a drip, due to the vertical riser, openings had to be located at drip locations. An alternative to this was to arrange the openings so that the drip was located near the center of a section, then advance the equipment to the drip and use this as the starting point for treating. Another factor in the location of the openings was the location of lateral mains. The openings had to be located so as to prevent long by-passes to supply these lateral mains.

Using these factors as a guide, the locations of the openings were chosen.

It was also necessary to determine how the services were to be supplied while the section from which they were tapped was out of service. For the entire length of the job there were nine 1¼-in. services and one 2-in. service. Two of the 1¼-in. services were located on the north or far side of the road. Also, two of the 1¼-in. services could be shut down, as they were not being used during the particular time the work was being performed. The 2-in. service supplies a hospital and a shut down, even of a short duration, was not possible, making a by-pass necessary.

The original plan was to adjust or convert the appliances and supply the seven 1¼-in. services with bottled LPG. It was felt this was more economical and practical than running by-passes. There was little question that for the services on the north side, LPG was the answer since extending a by-pass across the roadway would be very costly. In converting appliances on the services on the north side, however, problems were encountered and it was decided that, for the services on the south side where the main was located, the by-pass method would be used.

The work was planned to begin the job at the eastern end and work to the west. In order to have the main ready for treating when the contractor's crew arrived on Monday, September 9, it was necessary for our crew to start several days in advance. On Thursday, September 5, our crew started excavation and by the evening of Saturday, September 7, 2250 ft of main had been taken out of service, purged with CO_2 and was ready for treatment.

It should be noted that 2250 ft rather than 600 ft was taken out of service. The main was cut dead for as long a section as field conditions would permit. Although openings were still required, approximately 600-ft apart, this method kept the tapping, stopper work, blocking, and the handling of gas to a minimum.

Once this footage of main was prepared for treatment in advance of the coating operation, our crew was able to keep its excavation work well ahead of the coating crew. Naturally, the ideal schedule would be to have the main prepared for the treatment one section ahead of the coating operation. The required curing time prevented this from being done. Due to the by-pass involved, it was necessary to gas out the section that had been coated, before gas could be taken off the next section, and this could not be done until the curing time had elapsed on the newly coated section. Thus, it was necessary for the coating crew to shut down for

Internal Sealing — 5200 Ft of 8-In. C.I. Main
Day to Day Work Progress

	Clean		Clean Accumulative Total		Coat		Coat Accumulative Total		
Date	Joints	Footage	Joints	Footage	Joints	Footage	Joints	Footage	Remarks
9- 9(Mon.)	19	223′ 7″	19	223′ 7″	19	223′ 7″	19	223′ 7″	
9-10 (Tue.)	12	136′ 4″	31	359′ 11″	—	—	19	223′ 7″	
9-11 (Wed.)	19	223′ 11″	50	583′ 10″	31	360′ 3″	50	583′ 10″	
9-12 (Thur.)	45	537′ 2″	95	1121′ 0″	40	481′ 10″	90	1065′ 8″	
9-13 (Fri.)	24	283′ 9″	119	1404′ 9″	29	339′ 1″	119	1404′ 9″	
9-14 (Sat.)	50	582′ 3″	169	1987′ 0″	36	418′ 8″	155	1823′ 5″	
9-15 (Sun.)	21	262′ 2″	190	2249′ 2″	35	425′ 9″	190	2249′ 2″	
9-16 (Mon.)	—	—	190	2249′ 2″	—	—	190	2249′ 2″	Tie-ins
9-17 (Tue.)	24	287′ 0″	214	2536′ 2″	24	287′ 0″	214	2536′ 2″	
9-18 (Wed.)	22	271′ 3″	236	2807′ 5″	—	—	214	2536′ 2″	
9-19 (Thur.)	21	247′ 9″	257	3055′ 2″	43	518′ 0″	257	3055′ 2″	
9-20 (Fri.)	26	320′ 3″	283	3375′ 5″	26	320′ 3″	283	3375′ 5″	
9-21 (Sat.)	—	—	283	3375′ 5″	—	—	283	3375′ 5″	Tie-ins
9-22 (Sun.)	28	332′ 2″	311	3707′ 7″	28	332′ 2″	311	3707′ 7″	
9-23 (Mon.)	24	299′ 10″	335	4007′ 5″	20	240′ 0″	331	3947′ 7″	
9-24 (Tue.)	49	567′ 8″	384	4575′ 1″	53	627′ 6″	384	4575′ 1″	
9-25 (Wed.)	32	391′ 3″	416	4966′ 4″	—	—	384	4575′ 1″	Tie-ins
9-26 (Thur.)	20	201′ 2″	436	5167′ 6″	52	592′ 5″	436	5167′ 6″	

Last joint 7:50 PM 9-26-57

Fill in pieces total—96′ 1″

one day while a new section was prepared for coating.

The coating operation progressed smoothly and without incident until Friday, September 13. As the squeegee was removed from the main, it was found to be saturated with an oily substance assumed to be the wetting agent previously used in the main. This came as quite a surprise since as previously discussed, the drips on the line had been checked and blew dry. Apparently, the main was trapped and this oil had been lying in the trapped area.

This created a problem because the joint area must be dry to insure good bond between the main and coating material. To correct this situation, the contractor used an absorbing agent to remove the oil from the main. The agent was placed into the open end of the pipe and using a squeegee with one disc on the shaft, distributed through the section. A burlap swab was then used to shuttle the agent in the main. The squeegee, with all the discs on the shaft, was then used to remove the agent.

To further clean the main, air was blown through the main. After this treatment, the main was dry and clean and the coating operation resumed. Oil was found in several other sections. Except for this oil problem, the job continued on schedule with very good progress being made.

On Thursday, September 26, the last joint was coated and the coating operation completed. By Monday evening, September 30, all by-passes had been removed, the excavations closed and the line was back to normal. Thus the job was in progress 26 days.

A "Day to Day" Progress Report is shown in the accompanying table.

Test Results

Because this was the initial use of the internal sealing method on the Philadelphia Electric Company system, it was felt desirable to perform tests that would measure its effectiveness. One method of testing would be to re-open the bar holes made during the leak survey and take *Gas-scope* readings. These readings could then be compared with the readings taken when making the leak survey, before the main was treated.

Due to residual gas in the earth, however, results obtained by this method, used such a short time since the sealing operation, conceivably could be quite misleading. Since the earth in this area is, generally, a medium tight clay, and the main is located under a concrete roadway, it might take several months for this residual gas to be vented to the atmosphere. Until this period had elapsed, this method of testing should not be used.

To obtain an immediate indication of the effectiveness of the internal sealing, the following method was used: A section of main was chosen as a test section. This section was 544 ft long and contained 45 joints. There were no services or lateral mains tapped off of this section and it was conveniently located for testing. Also, prior to coating, it had been necessary to treat this section to remove oil, as previously discussed.

After this section had been purged and prepared for coating, dead-end caps were installed and blocked. A by-pass, with a valve, was installed from the "live" main, to the test section, and a 5-M meter was installed in parallel. The meter was valved off and the test section filled with gas at the line pressure of 5.1 psig. The by-pass valve was closed and the meter turned on, and any leakage on the test section would be recorded on the meter. A leakage of 124 cu ft per hour or 2.8 cu ft per hour per joint, was recorded.

As a matter of interest, the following additional tests were made. A house regulator was installed in the jumper feeding the test section and the section was filled with gas at 2.5 psig. The leakage was metered and found to be 54 cu ft per hour or 1.2 cu ft per hour per joint. This was repeated with 6-in. w.c. on the test section with the leakage being 5.2 cu ft per hour or 0.11 cu ft per hour per joint.

The testing equipment was removed and the section treated.

After the curing time had elapsed, the section was prepared for test in the same manner as described above. The test section was filled with gas at the line pressure, which was now 5.6 psig. The by-pass valve was shut and the meter turned on. The hand on the one-half cu ft dial was marked and the dial observed for 1½ hours. There was no visible movement on the hand by the end of this time. As an added test, the meter connection was shut off and a mercury manometer was installed on a purge connection at the dead-end cap. This manometer was observed for 45 minutes with no pressure drop occurring. Thus, in the test section, the leakage had been completely stopped.

In July, 1958, the bar holes made during the original leak survey were re-opened, and *Gas-Scope* tests were made .These tests showed that no gas was present and that the internal sealing had provided complete correction of the leakage.

Effectiveness of Method

To arrive at a conclusion as to the effectiveness and other aspects of this method, the actual should be compared with the estimated:

Original Estimate: $27,850.00 or $5.53 per ft 21 to 28 working days
Actual Cost and Time: $27,774.00 or $5.26 per ft 26 working days

This comparatively short time, coupled with the fact that only 10 openings rather than 436 were required, was of considerable advantage from a public relations standpoint.

In conclusion, it can be stated that the internal sealing method is a satisfactory and economical method to correct leaking joints on cast iron mains.

It must be pointed out, however, that this is not a cure-all. As previously discussed, this method should only be used where the main has a two-way feed, the number of services and lateral mains are at a minimum, the main is located under paving and there are no offsets, bends, or short radius curves. If these conditions are not met, this method loses certain advantages and other methods may be more economical and satisfactory. ★

Plane on runway approach at Benton, Arkansas' Saline County Airport, is guided in by an outline of gas lights, believed first installation of its kind.

Unique New Installation

Gas Lights Light Airport Runway

MODERN GAS LIGHTS are being put to a brand new, practical use at the Saline County Airport at Benton, Arkansas, where they now light a 3100-ft runway. The 52 gas lights are believed to be the first used anywhere for runway lighting. Three other similar projects have been contracted at other Arkansas airports.

The lights used at Benton are modifications of the "Doorman" model "Gaslite," minus the wall mounting bracket, manufactured by Arkla Air Conditioning Corporation at Evansville, Indiana, a wholly-owned subsidiary of Arkansas Louisiana Gas Company, which installed the lights early in March.

The 20 lights lining either side of the landing strip have clear lens and are located at 130-ft intervals. The six lights along the threshold at either end of the strip have bluish-green lens, forming a "T" shape lighting arrangement from either the north or south approach. They are mounted atop 11-in. cones, painted international yellow. Inside are about three feet of tightly coiled ¼-in. copper tubing.

Controlled by Photocell

The Benton system is controlled by a photo-electric cell that responds to light changes from normal nightfall to heavy overcast. As darkness increases, the cell increases gas pressure to the Gaslites, which in turn raises the flame, increasing the light output. The airport gas lighting system has proved very satisfactory and pilots report excellent visibility.

The Saline County Airport is owned by the Saline County Airport Development Corporation, which contracted with Arkansas Louisiana Gas Company to install the Gaslite system for a total cost of $1000. The airport, operated by Smith Flying Service, is located on U.S. Highways 67 and 70 about a mile south of the central Arkansas city.

Inspecting one of the 52 gas lights on the runway are, left to right, Frank Shanks, Arkansas Louisiana Gas Company manager at Benton; John Hartsfield, Little Rock, superintendent of distribution of ALG's Arkansas division, and Olin Smith, Jr., airport operator.

Three More Systems Slated

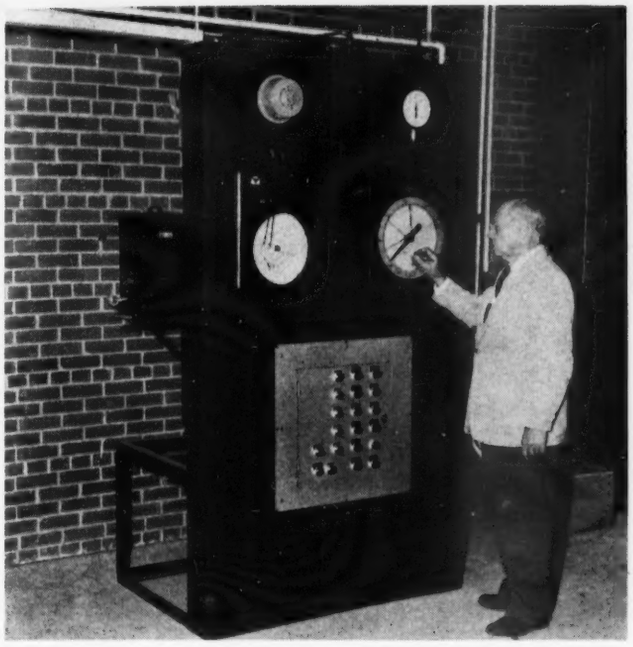
At North Little Rock, that city's Airport Commission has contracted with the gas utility for installation of 50 gas lights for North Little Rock's Municipal Airport. The system will be installed as soon as paving is completed on the 4000-ft landing strip.

A private airport near the southwest Arkansas town of Lewisville, owned by Dr. R. H. Harrison, also will have 48 gas lights along its runway and taxi strip. Another airport installation has been sold at McCrory, Arkansas, bringing the number of contracts already signed to four. This is a privately-owned airport where 50 gas lights will be installed.

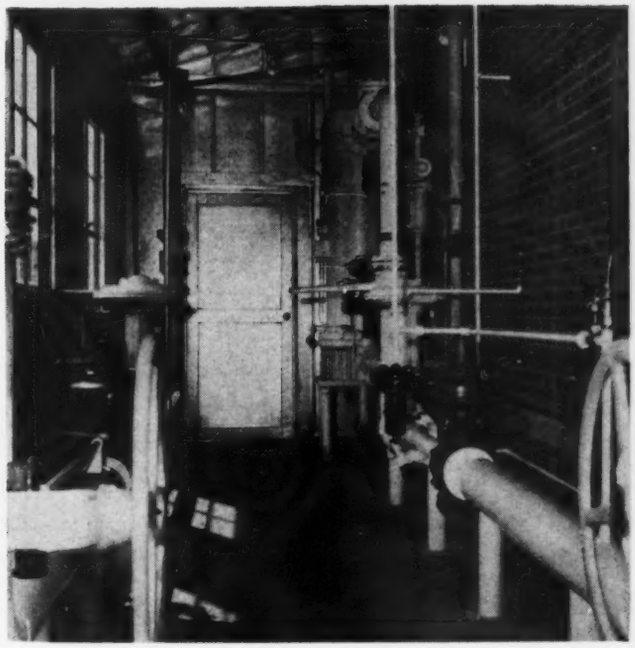
Installation of lights at the other three airports should begin within the next 30 to 60 days. Several other Arkansas cities have expressed interest in lighting their airport runways with this low-cost practical new way of outdoor lighting.

Safety Feature

Extensive safety tests have been performed by the gas company on the airport gas lights. The extra three feet of coiled tubing under the position marker cones is an added safety factor. Should a plane hit one of the lights, the tubing would bend rather than break. * * *



Nerve center for operation of the propane-air plant is this control panel; its operation is described in text.



Mixing room of Ft. Benning plant was built on the job; packaged units come prefabricated, ready to go.

At Fort Benning, Georgia . . .

New Propane-Air Peak-Shaving Plant 'Completely Different' Mixing System

WHENEVER THE ARMY INFANTRY CENTER AT FORT BENNING, GEORGIA, needs to use its new peak shaving plant, only 40 minutes is required to put it "on line." Of that time, 35 minutes are required to raise steam pressure in the packaged boiler that feeds steam to the propane vaporizer. Four of the remaining five minutes are consumed in bringing the air compressors up to operating pressure and for opening manual stop valves on storage tank system and opening valves on gas lines to the supply system. (The valves are closed during long periods of shutdown.)

After these preparatory steps are taken, approximately one minute is required for the operator to set the control panel selector switch to manual operation, push the plant start button, wait for operating conditions to stabilize, turn selector switch to automatic, and watch for a row of green lights to go on, signifying that the plant is in full automatic operation.

Outstanding feature of the new plant is that it gives a predetermined Btu gas content almost immediately upon startup and maintains this Btu content throughout the full operating range of the plant—even when instantaneous load changes might occur at a very frequent rate. In fact, the basic principle of the uniquely designed mixing system guarantees no appreciable Btu fluctuations on startup or on load changes.

The plant facilities consist of a tank car unloading station, seven 30,000-gal propane storage tanks, a propane liquid booster pump, a mixer house divided into two rooms — one housing the vaporizer and mixer, and the other housing the boiler, air compressor, and control panel.

Appearance of the plant is that of a well-designed system complete with adequate safety and operating controls but devoid of many expensive, complicated gadgets.

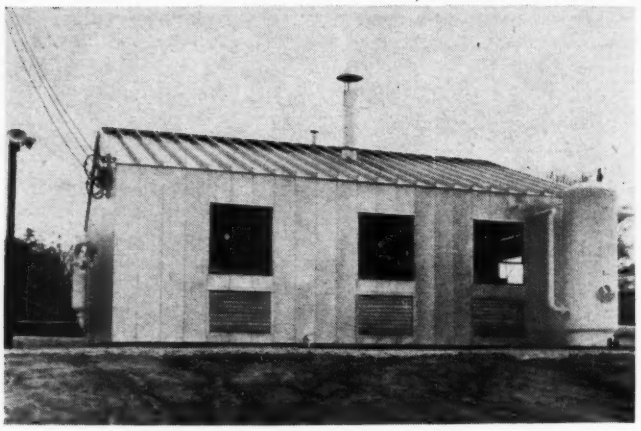
Four different fuels are used at Fort Benning—natural gas, coal, oil, and propane-air. All gas-fired equipment uses natural gas (except on curtailed-use days) because it is the cheapest fuel at commodity rate available at this location. When curtailment occurs, coal and oil are used for standby wherever they can be successfully utilized. Whenever gas load demands by equipment that cannot use coal or oil are predicted to rise so that gas consumption at the Fort will exceed firm demand for a 24-hour period, the flow controllers on the natural gas supply are set at a point where all firm gas will be used but firm contract not exceeded.

The propane-air plant is then put on the line to supplement the natural gas supply, and to keep system pressure at its standard 30 psi. In other words, the propane-air plant floats on the line and operates at constantly varying flow rates.

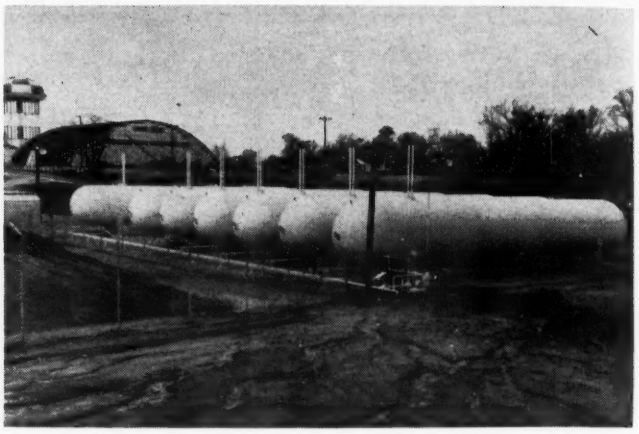
How Unit Works

The system is started by a push button control with selector switch set on manual, which locks out safety devices. During this part of the cycle an orange signal light is on. The control panel is shown in an accompanying photograph.

As soon as operating conditions are established (maximum of 30 seconds except for Btu, specific gravity, or flame factor indicator units which may require more than 30 seconds to sense conditions due to lag in sample lines and/or lag in sensing mechanism) selector switch is turned to automatic and a complete row of green lights indicates unit is in automatic operation



Exterior view of Ft. Benning peak shaving plant.



Seven 30,000-gal tanks store propane at Ft. Benning.

and that operating conditions are satisfactory.

If a malfunction occurs, resulting in operating conditions not in accordance with preset limits, the particular safety control that has had its limits violated shuts the system down with a less than 3 second time lag, the applicable green signal light goes out, the applicable red signal light goes on and an alarm horn sounds. The plant operator can immediately determine where to look to remedy the trouble. After the trouble is remedied the plant is restarted as described above.

Normally these safety cutouts are:

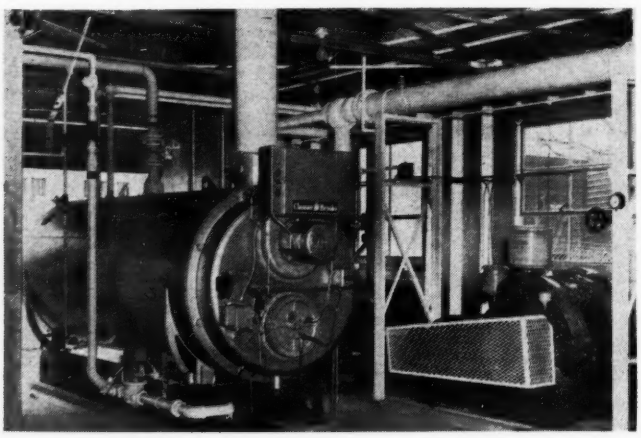
(1) High or low Btu,
(2) Low air pressure,
(3) Low propane pressure, and
(4) High mixer differential pressure.

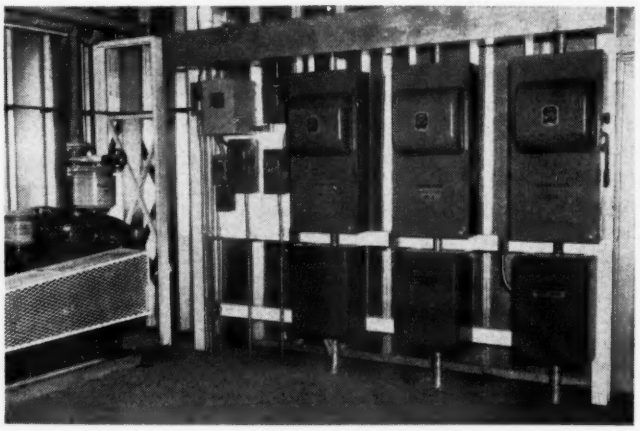
Features of the new plant include:

1. Quick, accurate start up and plant operation. Unit is shipped out as a package; starting service and training of operators included.
2. Push button control for fully automatic operation. Will start up under exact Btu control.
3. Designed for expansion from 125,000 to 312,000 cu ft per hour of propane-air equivalent to natural gas; this expansion is accomplished simply by adding air compressors and auxiliary equipment.
4. Unit has full complement of simple safety controls. Does not depend on complicated control and sensing instruments for its proper operation.
5. High turn-down ratio. By minor changes in the basic plant, turn down ratios can be obtained to anything desired by the owner.
6. Maintains Btu value of ± 1 percent from set point within 30 seconds after startup and within 10 seconds after load changes. Will hold accurate Btu content on instantaneous load changes and does not "hunt."
7. Plant is economical to build, operate, and maintain.
8. Highly skilled operators are not required; controls are of type with which average gas service man is familiar. Ordinary semi-skilled labor can operate the plant with only one man in attendance.
9. Uses an entirely new principle of mixing. The system, basically, involves maintaining pressure drops of propane and air across manually preset calibrated orifices that are numerically equal at all flow rates. This means that the ratios of propane and air remain the same regardless of changes in the flow rate. Patents covering the unique operating principle of this mixing system have been applied for.
10. Proportional peak shaving can be added to be semi-automatic or fully automatic with a minimum of complication.
11. Unit can be used as a high pressure propane air mixing plant completely remotely controlled and unattended by operators.

The Fort Benning plant was designed and built by Applied Engineering Company, Orangeburg, South Carolina. The firm's APCO mixing system is produced in sizes ranging from 2000 to 2,000,000 cu ft per hour, and is shipped as a complete, packaged unit.

The mixing system comes complete with all required stop valves, check valves, flow controllers, and components of the mxing system assembled as one part of the packaged unit. Another package contains the control panel, complete with required controls and wiring intact, ready for attachment to the mixer. * * *





Building is divided into two sections — one side, above, is designed for non-hazardous equipment and houses boiler, air compressor, electrical gear, and control panel. Other side, designed for hazardous operations, houses vaporizer and mixer, is not shown.

An ounce of precaution is worth a pound of cure...

A Valve Maintenance Program for Gas Distribution Systems

Clifton R. Newlin, *Assistant Superintendent*
Gas Distribution Division
New Orleans Public Service, Inc.
New Orleans, Louisiana

IT WOULD BE QUITE LOGICAL for anyone responsible for the valves in a gas distribution system to ask certain pertinent questions and monologue the answers:

1. **Why maintain our valves?** *We use them so infrequently.*
2. **Can we justify the cost?** *In the past we have spent practically nothing.*
3. **What have we to gain?** *We seem to be getting by at present.*

These are all honest questions and quite honest answers, but further investigation reveals some interesting and provocative observations.

Our present valve maintenance program was developed about 10 years ago — not because it wasn't needed, but because we thought it was just good operating procedure to be assured that our valves were ready and waiting for the one big opportunity to work.

A great deal of money is spent on the original installation of a valve — and then it may become a forgotten issue. *Leave it alone — it will care for itself.* That may be true — until the day of an emergency, or perhaps just a routine operation, and then — *the valve is non-operative.* What follows is unpredictable; however, the manufacturer will surely be criticized for a questionable product.

Many gas utilities have hundreds of line valves and perhaps thousands of service valves, and possibly, no valve maintenance program. Now, whether your need be dynamically urgent or simply an inquisition on the subject, here are the steps to be taken:

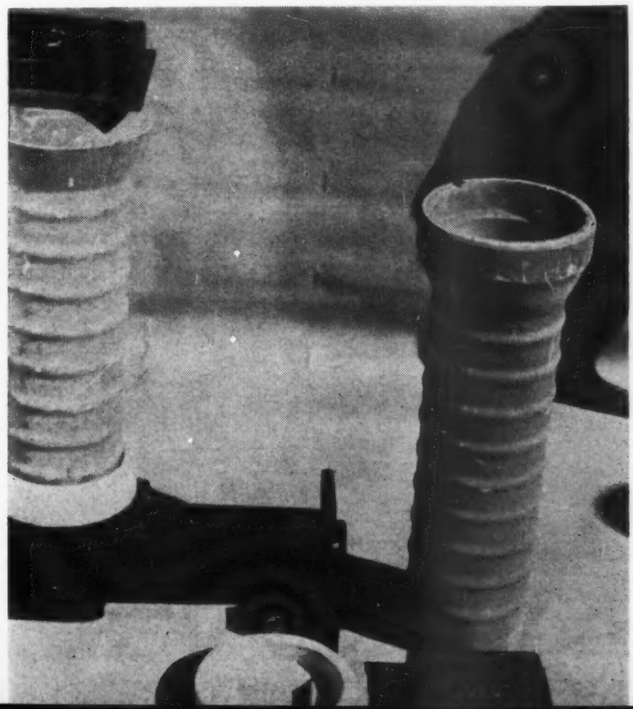
1. **Decide the extent and ramifications of your program.** Will it be confined to line control valves that are essential to sectionalize your system? Will all main valves be included? How about service valves?
2. **Utilize all available records to help compile a summary of valves to be checked.** This may be simple, or it may be quite complex, depending on previous records maintained. A field check may be necessary to a limited extent.
3. **Plan your work schedule.** An initial inspection crew comprised of an experienced foreman and one helper might be best to initiate the program. This will provide a trend and exemplify the restoration program to return the valves to satisfactory order.
4. **Set up a program so inspection will be made annually or more often as necessary.**

What are the tools, equipment, materials, etc., that are essential for the program? The accompanying illustrations should provide the answers.

AT NOPSI, we decided to maintain our valves on a yearly basis and to include all main valves and those service valves supplying commercial and industrial customers — a total of approximately 2100 valves ranging in size from ¾ to 24-in. Practically all of these valves are of the lubricated plug type; some gate valves are used, however, on the lower pressure lines.

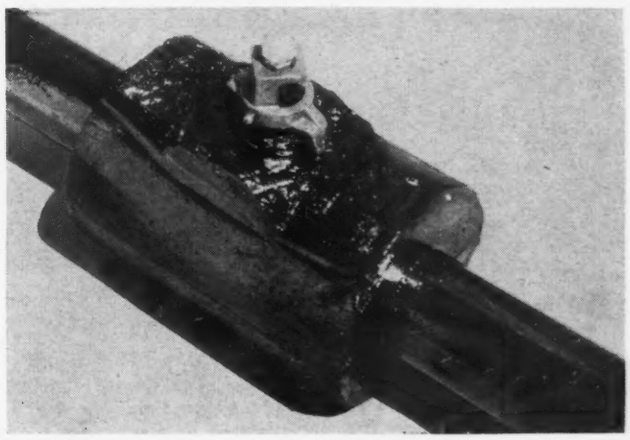
(In connection with gate valve maintenance, we are indebted to Don Mac-

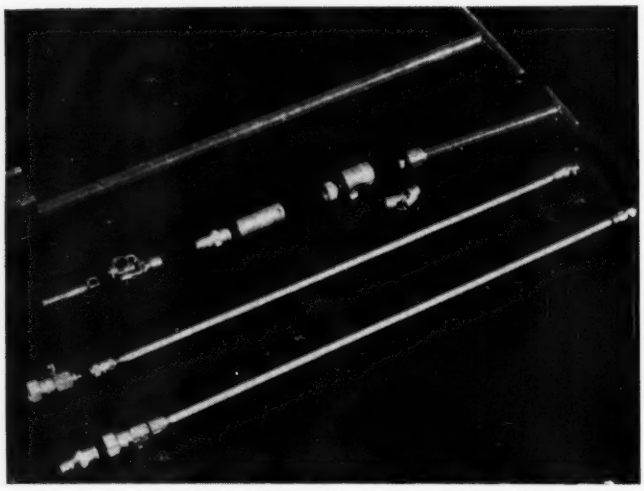
Field investigation of valve boxes proved need for new type valve standpipe — one adaptable to a variety of valve sizes and types, providing adequate hand room to work, of sturdy construction and inexpensive. Typical valve standpipe installation shown is for sidewalk location. Concrete base plate, concrete pipe and cast iron valve box are included and total cost is approximately $8.50. Units are adapted to valves from sizes ¾ through 6-in.



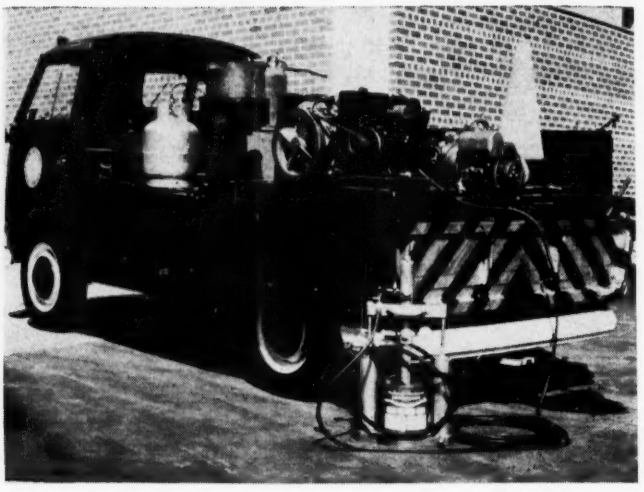
Problem: Decide what type of grease fitting to use. Usual grease stem furnished with a valve did not afford effective lubrication and was impractical to use where the valve was installed at normal depths. Extending grease fitting to ground level was impractical due to exposure to damage and loss through theft.

Fitting shown is a No. 1875 ½-in. pipe thread Alemite heavy duty fitting, complete with cap. The cap protects the threads and assures entry of clean grease into valve. (Button head fitting now furnished with valves by some manufacturers is of no value where greasing is performed through a standpipe at valve level. Alemite fittings are available in various sizes, can be adapted to practically all valves. Cost of complete fitting is approximately $1.85.





Equipment and tools, above, were essential to a program of changing from grease stems to grease fittings. Removal of the grease stem, working through a standpipe, was quite a problem. Design of special tools made job relatively easy. Tools were used to hold valve in its operating position while unscrewing the old stem. It was important to prevent valve from accidentally closing during this operation. Other tools shown were used to install new grease fitting, cap, etc.



Mechanical lubrication equipment includes pneumatically operated grease gun, suitable air compressor, and various accessories. All items are used in annual maintenance program, which requires approximately 3 months for a 2-man truck crew. Cost of equipment is approximately $900.

Collum of the Rochester Gas & Electric Corporation for the photographs illustrating their unique method of maintenance on gate valves.)

Smaller sizes of gate valves or other non-lubricated types of valves are so constructed that maintenance to the valve is impossible or unnecessary. It is important, however, to ascertain that the handhole and standpipe are kept clean, in good repair, and that the valve is accessible.

Obviously a program of this type involves money, and though our costs may not be too closely related, it may be of interest to know that the yearly maintenance cost of approximately 2100 valves averages about $1 per valve.

To initiate this program, however, the cost was much more for such items as renovations to handholes and valve boxes, installation of grease fittings, purchase of greasing equipment, etc.

This cost would vary according to your particular system and the extent of your program, but roughly it amounted to approximately $3.50 per valve for our initial cost.

What is to be gained from this? Without dealing with the intangible benefits, we can list these:

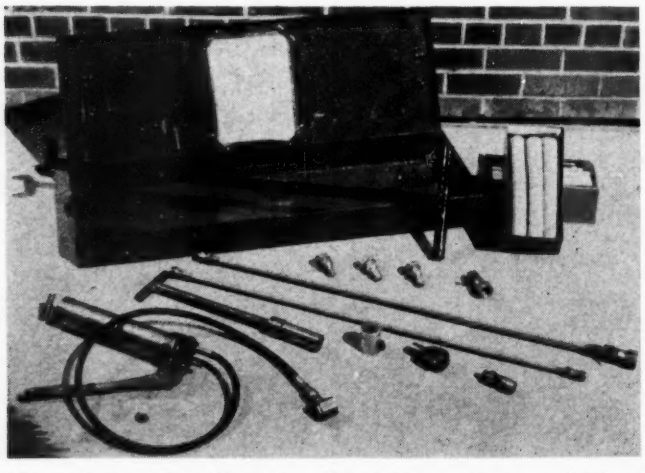
1. Valves are installed with one purpose in mind — to operate when required, and to provide a positive shutoff. This program assures that.
2. Our responsibility to maintain a safe system requires that we must be able to isolate sections of mains and service on short notice. *Valves that operate* permit the fulfillment of this.
3. Regularly maintained valves provide the assurance that major costly maintenance will be avoided in the future.
4. Valve maintenance may be required in order to conform with certain rules and regulations.

Finally, it is advisable that you take advantage of the helpful recommendations and assistance that are readily offered by many of the valve manufacturers. In our case, one valve manufacturer assisted us with various remedial corrections on troublesome valves, and provided specialized personnel to work with our field crews in assisting wherever necessary. This type of cooperation is a sure indication that the manufacturers are well aware of our problems and equally ready to assist in solving them for us.

Are your valves working today? Well, maybe. *How about being certain with a planned maintenance program?*

Acknowledgment

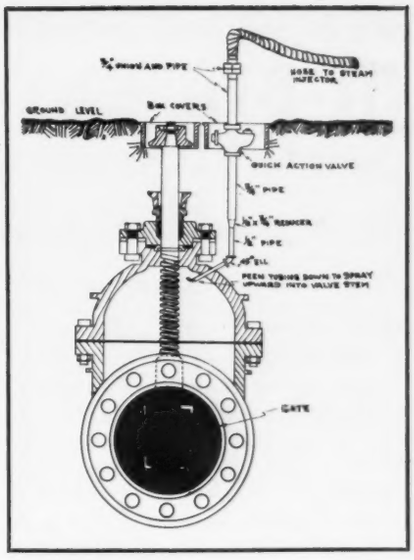
This article adapted from a presentation made at the 1959 A.G.A. Distribution Conference, Cincinnati, Ohio. *



Kit of tools and equipment used by field crews for any additional valve greasing required after the completion of the yearly program. Excessive valve usage and need for a guaranteed positive shutoff may require additional greasing operations.

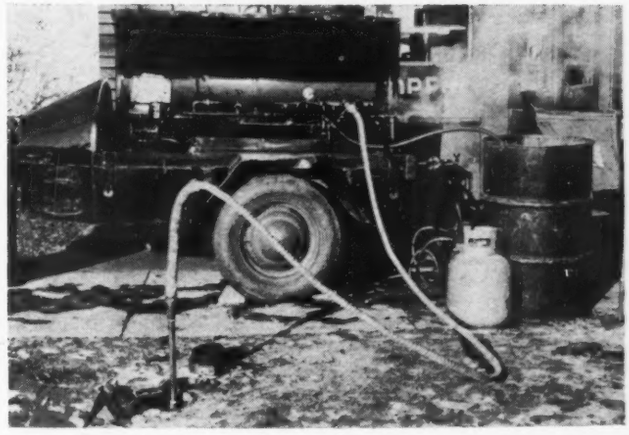
Valve installed in handhole, being greased.

Valve installed in manhole being greased. Waterproof gear grease is also applied to exposed gears for this type of valve.



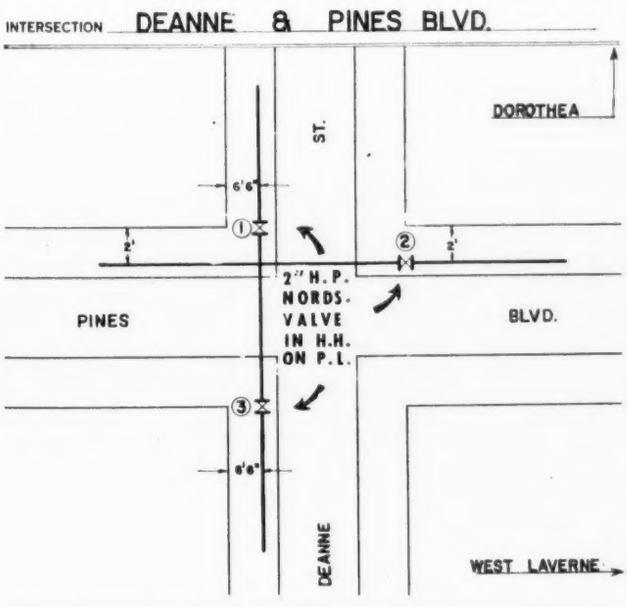
Cross section sketch shows steam line connection and fittings essential to freeing stuck gate valve. Steam and, in some cases, a detergent, are injected into the area where the gear is usually frozen.

View shows handhole through which gate valve adapter is accessible. Also shown is handhole that houses the valve connected to piping for steam injection into valve bonnet.



Portable steam generator. Propane-fueled burner provides heat. Relief valve is set at 75 psi, but boiler is normally operated at 40 to 50 psi. Steam pressure is maintained at least 10 psi greater than gas pressure.

FRONT (Both Cards)



Valve history card includes all data and references to the valves shown. Any maintenance other than that performed by the regular valve greasing crew, is shown on this record. Card used by valve maintenance crew as their record differs on reverse side, shows loca-

BACK — Valve History Card

VALVE HISTORY RECORD

REF. NO.	JOB NO.	SIZE	PRESS	TYPE	M.H. H.H.	DATE	REMARKS
1	58970	2"	H. P.	NORDS	H. H.	8/7/54	INSTALLED VALVE
2	60153	2"	H. P.	NORDS	H. H.	1/6/55	INSTALLED VALVE
3	60154	2"	H. P.	NORDS	H. H.	1/6/55	INSTALLED VALVE
2	61439	2"	H. P.	NORDS	H. H.	2/9/55	LOCATED VALVE-RAISED H. H. TO GRAD
1	73964	2"	H. P.	NORDS	H. H.	3/6/57	CLEANED H. H. -INSTD. NEW B. B. COVER
3	81642	2"	H. P.	NORDS	H. H.	8/8/57	RECOATED VALVE

BACK — Valve Greasing and Maintenance Record

VALVE GREASING AND MAINTENANCE RECORD

	1	2	3	4	5	6	7
DATE	2" H.P. NORDS.	2" H.P. NORDS.	2" H.P. NORDS.				
6/1/55	G.-MAINT.	G.-MAINT.	G				
5/28/56	G	G	G				
9/4/57	G	G	G.-MAINT.				
7/12/58	G	G	G				

tions and dates of annual greasing. Any minor maintenance, such as cleaning out the handhole, replacing adapter, etc., is also recorded. More complex maintenance is referred to another crew and a record of that work is shown on valve history card.

Hi-Btu Gases from Fluid Fuels

Present and Future Methods

Part 5 — Continuous Pressure Hydrogasification

Henry R. Linden, *Research Director,* **and Martin A. Elliott,** *Director, Institute of Gas Technology, Chicago, Illinois*

Moderate-Pressure Operation with Natural Gas Liquids and Paraffinic Petroleum Distillates.

A demonstration plant for the continuous conversion of low molecular weight, paraffinic hydrocarbon fuels, such as natural gasoline, light naphtha, kerosine and No. 1 fuel oil (C/H weight ratios below 6.3) to high-Btu gas (0.5 to 0.6 specific gravity), has been developed and operated by the Institute of Gas Technology and is shown in Fig. 8.

Liquid products formation is minimized, and carbon formation essentially eliminated, by operation at 50 to 100 psig and hydrogen/hydrocarbon feed ratios ranging from 50 Scf per gal of propane to 100 Scf per gal of kerosine or No. 1 fuel oil. Typical product gas properties are given in the table at top of next column.

As a result of their high methane and ethane content, and their low olefin content, these product gases are completely substitutable for high-methane natural gas.

Process hydrogen of 90 to 95 percent purity is produced by catalytic steam reforming of a low sulfur content, low molecular weight hydrocarbon stream, followed by catalytic water-gas shift and carbon dioxide removal. Natural gas supplied at about 100 psig in amounts equivalent to 10 to 20 volume percent of the total product gas yield is the preferred source of hydrogen, although recycle gas, LPG and natural gasoline can also be used. Allowances must be made, however, for reduced reforming capacities and higher steam requirements when the higher molecular weight hydrocarbon feeds are used.

Feedstock:	Grade 26-70 Natural Gasoline	No. 1 Fuel Oil or Kerosine
Composition, mole %		
N_2	0.4	0.6
CO	1.1	1.3
CO_2	0.9	1.1
H_2	31.7	38.3
CH_4	39.2	38.1
C_2H_6	12.6	9.3
C_3H_8	0.0	0.5
C_2H_4	11.9	8.9
C_3H_6	2.2	1.9
Total	100.0	100.0
Heating Value, Btu/Scf	974	883
Specific Gravity, Air=1	0.55	0.49

Fig. 8 shows a cross-section through a single tube bank

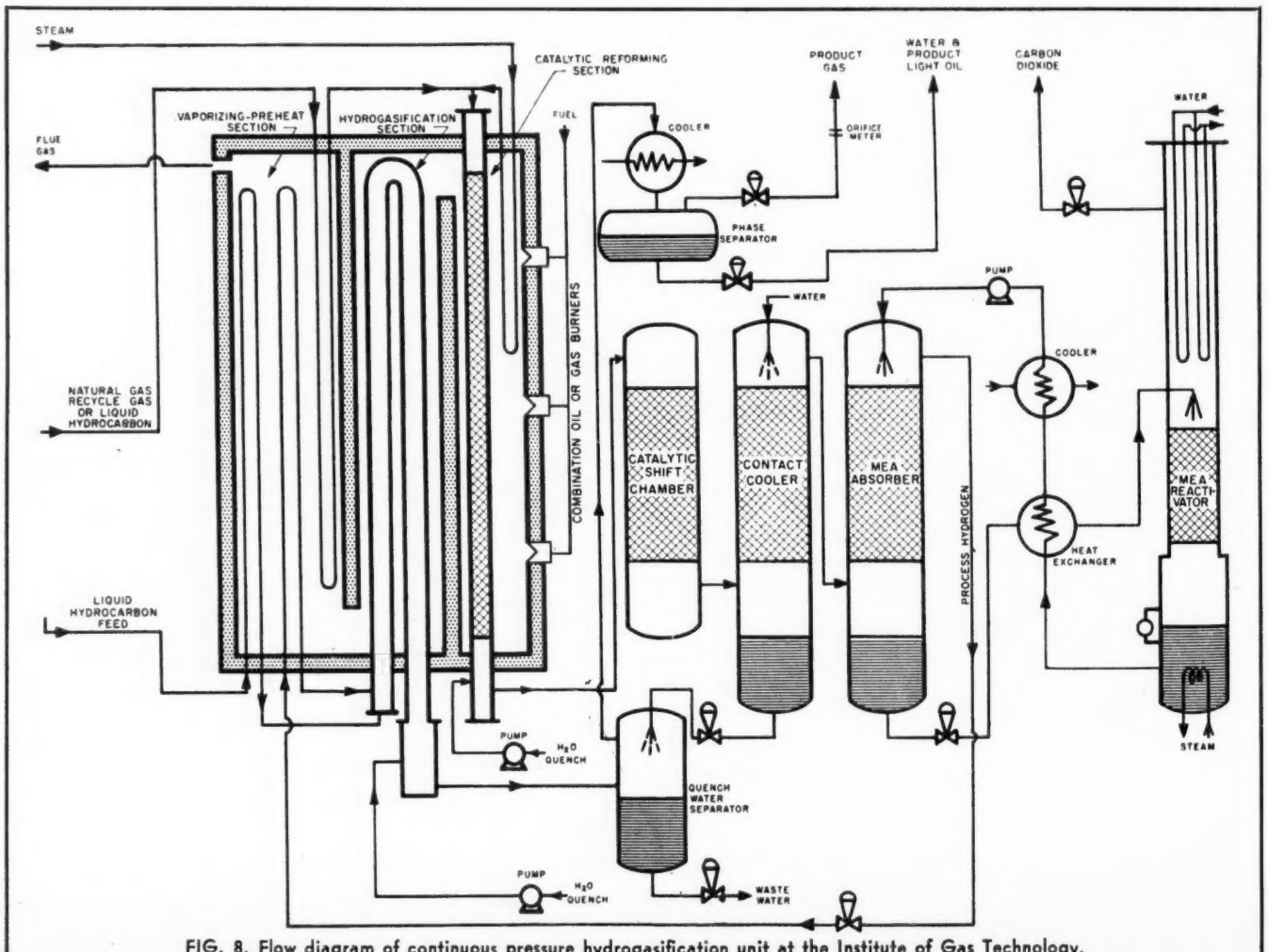


FIG. 8. Flow diagram of continuous pressure hydrogasification unit at the Institute of Gas Technology.

of a multiple tube furnace (two tube banks were used in the demonstration plant). The reforming tubes are installed in the direct-fired section of the three-section furnace, and operated at wall temperatures of 1600 to 1800 F and pressures of up to 100 psig. In the low-temperature convection section of the furnace, the hydrocarbon feed is vaporized and preheated, and process hydrogen is reheated. These feed streams then enter the high-temperature convection (hydrogasification) section of the furnace at approximately 700 F; hydrogasification occurs at 1340 to 1400 F and 50 to 75 psig in the inverted pipe loops (hairpins).

The three-section tube furnace design gives maximum heat economy, since the waste heat from the high-temperature reforming section is used to raise the hydrocarbon-hydrogen mixture to reaction temperature, and to vaporize and/or preheat all process feeds. This design also provides the high heat flux densities required for the endothermic steam-hydrocarbon reforming reactions, as well as the relatively low heat flux densities required for hydrogasification; after attainment of a threshold temperature of about 1300 to 1350 F, the overall hydrogasification reactions are slightly exothermic.

Table 15 is based on representative demonstration plant results with Grade 26-70 natural gasoline and No. 1 fuel oil.

Product yields have been adjusted to give complete carbon, hydrogen and oxygen balances. Tube furnace sizes are based on a natural gasoline feed rate of 63 gal per hr per tube bank, and a No. 1 fuel oil or kerosine feed rate of 42 gal per hr per tube bank. This is equivalent to gasification capacities per tube bank of about 8 Mcf and 6 Mcf per hr, respectively.

Reforming tube and catalyst requirements are based on the use of one 6-in. OD by 5-in. ID reforming tube, containing a 20 ft catalyst bed, for each 8-in. IPS by 20 ft long hydrogasification hairpin. (These were the actual sizes used in the final demonstration plant operation.)

This corresponds to a reformed gas space-time yield of 1800 to 1900 Scf per cu ft of catalyst per hr. The carbon monoxide shift catalyst requirements are based on a reformed gas space velocity of 600 Scf per cu ft of catalyst per hr. The catalyst costs per MMBtu of total product gas shown in Table 15 assume a catalyst life of 7200 hours in peak shaving operation.

Process steam requirements are based on the conditions: 3 lb-moles of reforming steam per lb-mole of carbon fed as hydrocarbon; 250 lb of stripping steam per Mcf of carbon dioxide removed; and sufficient quench steam to maintain the carbon monoxide shift reactor at 700 F. Fuel requirements of 30 MBtu per gal of natural gasoline, and 37 MBtu per gal of No. 1 fuel oil or kerosine, are based on demonstration plant performance, and correspond to thermal efficiencies of 80 to 85 percent.

Product gas raw material and utility costs can be computed by two methods when natural gas is used as a source of hydrogen:

In base load operation, the cost of the total product gas can be determined by placing a fixed value on the natural gas consumed;

In peak shaving operation, the natural gas should be assigned the same value as its heat equivalent of product gas, and the cost of the net product gas (heat units of total product gas less heat units of process natural gas) determined on this basis.

At the unit costs and credits listed in Table 15, and a charge of 45 cents per MMBtu for natural gas, the material and utility costs of the total product gas are $0.96 per MMBtu with natural gasoline feed and $1.01 per MMBtu with No. 1 fuel oil feed. The comparable net product gas material and utility costs are $1.05 and $1.16 per MMBtu, respectively.

This is substantially less than the equivalent cost of 1400 Btu per Scf propane-air (on the basis of 9.5 cents per gal propane), which has, at best, the same level of substitutability for high-methane natural gas as the product gases shown above. In areas where propane has a lower cost, natural gasoline should also be available at proportionally lower cost.

Labor costs shown in Table 15 were estimated as part of the fixed costs on the assumption of 12-hr shifts for peak load operation, the use of operating personnel for maintenance during off-peak periods, and an average labor cost of $3 per hr for 2100 hours per year. The labor requirements forming the basis for these cost estimates include one superintendent, one general foreman, one clerk, one laboratory assistant, two shift foremen, two gas makers, two fire-

TABLE 15. Material and Equipment Requirements and Product Gas Costs for Continuous Pressure Hydrogasification Process.

Basis: 1000 MMBtu per hour net capacity plant; gas volumes at 60 F 30 in. of mercury and dry

Process designation	I	II	III
Hydrogasification feed type	Grade 26-70 Natural gasoline	No. 1 fuel oil or kerosine	No. 1 fuel oil or kerosine
Gravity, °API	92.7*	42.0	42.0
Carbon/hydrogen weight ratio	4.96*	6.26	6.26
Reformer feed	Natural gas 1054 Btu/SCF	Natural gas, 1054 Btu/SCF	Product gas, 890 Btu/SCF
Raw material and utility requirements per MMBtu of total product gas			
Process natural gas, SCF	146	203	None†
Hydrogasification feed, gal	8.0	8.0	10.3
Process fuel, MBtu	240	300	380
Process steam (100 psig), lb	37	51	61
Amine regeneration steam (100 psig), lb	32	45	57
Cooling water, gal	300	400	500
Power, kwh	0.6	0.7	1.1
Credits per MMBtu of total product gas			
Steam generated by waste heat recovery (5 psig), lb	34	47	54
Liquid products, gal**	0.6	2.5	3.2
Unit costs			
Hydrogasification feed, cents/gal	9.5	11.5	11.5
Process natural gas, cents/MMBtu	Equivalent to product gas		
Steam (fuel cost only), cents/1000 lb		70	
Process fuel (Bunker "C"), cents/MMBtu		45	
Cooling water, cents/1000 gal		1.5	
Power, cents/kwh		1	
Catalyst and chemical costs, cents/MMBtu of total product gas			
Reforming catalyst at $1.40/lb	0.5	0.8	1.0
Carbon monoxide shift catalyst at $0.60/lb	0.8	1.1	1.4
Miscellaneous chemicals		1.0	
Unit credits			
Steam generated by waste heat recovery, cents/1000 lb		none	
Liquid products, cents/gal		10	
Material and utility costs less byproduct Credits, $/MMBtu of net product gas	1.05	1.16	1.17
Reactor tube and catalyst requirements per 1000 MMBtu of net product gas/hr			
Number of type 316 steel reformer tubes, 6 in. O.D. x 25 ft long	150	243	245
Number of type 316 steel hydrogasification hairpins, 8 in. IPS x 20 ft long	150	243	245
Steam-hydrocarbon reforming catalyst, (27 wt % nickel, ¾ in. x ¾ in. pellets, 80 lb/cu ft), cu ft	410	660	670
Carbon monoxide shift catalyst, (chromia-promoted iron-oxide, ⅜ in. x ⅜ in. pellets, 88 lb/cu ft), cu ft	1310	1960	1960
Annual fixed costs for 1000 MMBtu net product gas per hour plant, $			
Capital charges (depreciation, taxes, insurance, return), 15% of investment	701,000	982,000	999,000
Maintenance and testing materials, 1% of investment	47,000	65,000	67,000
Labor costs	101,000	101,000	113,000
Working capital (6% of the following: fresh catalyst cost, 30-day process fuel and feed supply, 30-day payroll cost)	52,000	69,000	70,000
Total	901,000	1,217,000	1,249,000
Annual load factor, %	5 25	5 25	5 25
Unit fixed costs, $/MMBtu of net product gas	2.06 0.41	2.78 0.56	2.85 0.57
Total cost, $/MMBtu of net product gas	3.11 1.46	3.94 1.72	4.02 1.74

*Assumed to be equivalent to n-pentane
†22.4% product gas recycle
**Based on liquid products specific gravity of 0.925

men, two by-product operators, two mechanics and two helpers, for Processes I and II; for Process III an additional two compressor station operators are required.

Fixed costs of $302 per MMBtu total daily capacity reported in Table 15 are based on a 1957 estimate by J. F. Pritchard and Company for the complete erected cost of a 3780 MMBtu per day total capacity plant for the production of 957 Btu per Scf natural gas substitute from natural gasoline.

This estimate is based on the use of natural gas as a source of process hydrogen, an oil-fired furnace containing 20 tube banks, and hot carbonate scrubbing for carbon dioxide removal. It was adjusted for the 28,400 MMBtu per day total (24,000 MMBtu per day net) capacity plant of Process I on the assumption that investment cost is proportional to the 0.7 power of total capacity and is not significantly affected by the substitution of monoethanolamine for hot carbonate scrubbing.

The resulting cost of $195 per MMBtu of net daily capacity for Process I was further adjusted to allow for reductions in capacity when No. 1 fuel oil is used as feedstock; the 0.7 power of the ratio of the number of tube banks required in Processes II and III, to the number required in Process I, was used for this purpose.

For Process III, an allowance of $100,000 was also made for the construction of a product gas recycle compressor station. On this basis, the estimated investment costs for Processes II and III, are $273 and $277 per MMBtu of net daily capacity, respectively.

Comparison of the cost for continuous pressure hydrogasification of low molecular weight distillates shown in Table 15, with similar data for cyclic cracking of petroleum oils shown in Table 10, indicates that:

a. At 5 percent annual load factor, the continuous process can produce a completely substitutable gas at 50 to 75 psig delivery pressure, in a plant constructed on a new site, at about the same cost as new cyclic high-Btu oil gas equipment installed in an existing plant.

b. At 25 percent annual load factor, the continuous process is not competitive with residual oil cracking in cyclic equipment constructed in existing plants on the basis of a liquid products credit of 10 cents per gal. It is competitive, however, with distillate oil operation in such plants.

In this comparison, no allowance is made for the cost of high-Btu oil gas compression, and costs related to the limited substitutability of high-Btu oil gas.

In general, the continuous process appears to have characteristics that make it the least costly source of peak shaving gas at load factors falling between those most economic for propane-air, and those most economic for high-Btu oil gas produced from residual oils. It has the advantage of relatively low investment cost as compared to cyclic cracking processes, particularly when gas for high-pressure distribution is required, as well as a high degree of independence from by-product credits. It also has the advantage of much lower feed storage costs than processes based on LPG, and should normally have lower net raw material costs than LPG-air gas of maximum substitutability for natural gas.

High-Pressure Hydrogasification

High-pressure hydrogasification processes are designed for essentially complete conversion of distillate and residual fuels into high-Btu gas. To accomplish this, and to produce high methane content gas substantially free of olefins, requires pressures and residence times considerably greater than those used in the continuous-tube furnace process just described.

Extensive laboratory-scale studies have been made to determine the effects of operating variables and feedstock properties on the yield and composition of products of high-pressure hydrogasification. The investigations of Dent and co-workers have been directed principally to the development of a process for production of 500 to 600 Btu per Scf gas. Work done at the Institute of Gas Technology has been in the range of operating conditions suitable for production of natural gas substitutes.

In the production of 500 to 600 Btu per Scf gas at pressures below 50 atmospheres, the hydrogen/oil feed ratios can be considerably greater than the stoichiometric requirement (200 to 300 Scf per gal). Temperatures may range from 1300 to 1650 F, and residence times as short as 10 seconds may be used. In contrast, gases of about 900 Btu per Scf are best produced at hydrogen/oil feed ratios between 75 and 125 percent of the stoichiometric requirement. Lower feed ratios result in excessive liquid products and carbon formation, and higher feed ratios in excessive hydrogen dilution. High-Btu gas production also requires pressures up to 100 atmospheres for the less reactive aromatic oils.

TABLE 16. Hydrogasification Results from British Gas Council Reactor Operation at 32 Atmospheres Pressure.

Run No.	38	41	39	50	52	55
Feed Oil						
Type	Light Distillate		Gas Oil	Crude Oil		Heavy Fuel Oil
°API	79.7		38.6	33.2		16.4
Carbon/Hydrogen Weight Ratio	5.25		6.46	6.85		7.59
Conradson Carbon Residue, wt %	0.0		0.0	5.0		11.0
Rate, lb/hr	135.9	253.1	142.2	156.3	161.9	119.8
gal/hr	24.37	45.39	20.53	21.85	22.63	15.04
Feed Hydrogen						
Rate, SCF/hr*	8720	7178	8747	7750	7925	825)
Feed Ratio, percent of stoichiometric	273.1	120.7	207.4	162.9	160.9	210.3
SCF/gal of oil	357.8	158.1	426.1	354.7	350.2	548.5
Run Conditions and Results						
Fluidized-Bed Temperature, °F	1364	1319	1436	1409–1454	1436–1508	1391–1445
Hydrogen Consumption, SCF/gal	82.5	77.8	118.9	115.9	138.0	127.0
Product Distribution, wt % of feed oil						
Gas	100.0	97.0	82.1	77.3	78.9	68.5
Liquid	0.0	3.0	17.9	20.7	18.7	27.3
Carbon	0.0	0.0	0.0	2.0	2.4	4.2
Product Gas Yield, SCF/gal	383.3	181.8	434.5	357.0	352.9	542.6
MBtu/cu ft reactor-hr	714	646	657	750	773	656
Net Btu Recovery, MBtu/gal	110.6	107.1	108.5	100.6	101.4	97.5
Product Gas Properties						
Composition, mole %						
$N_2 + CO + CO_2 + H_2S$	3.90	2.90	3.20	3.15	3.20	2.15
H_2	68.55	41.5	68.0	64.2	57.45	75.15
Unsaturates	0.2	0.25	0.0	0.25	0.15	0.1
C_nH_{2n+2} (Paraffins)	27.35	55.35	28.8	32.4	39.2	22.6
n	1.39	1.42	1.25	1.25	1.07	1.17
Heating Value, Btu/SCF	580	863	559	597	601	499
Product Liquid Properties						
Composition, wt %						
Benzene	—	83.9	65.8	45.8	46.1	33.1
Naphthalene	—	6.9	22.0	12.6	16.2	21.7
Higher Aromatics	—	9.2	12.2	41.6	37.7	45.2
Carbon/Hydrogen Weight Ratio	—	—	13.1	15.3	13.7	15.3

*Feed hydrogen 96.5 to 97.5 mole % pure.

Reaction times at 1400 F (maximum temperature set by reactor material limitation), range from 100 to 600 seconds. Long reaction times and high pressures favor methane formation.

The major problem in insuring reliable operation of high-pressure hydrogasification processes is control of carbon deposition. Two processes currently being developed use different methods for overcoming the normal carbon-forming tendencies of residual oils during pyrolysis or hydrogenolysis. The British Gas Council has successfully operated a 200,000 Scf per day fluidized coke pilot plant with feedstocks ranging from light distillate to heavy fuel oil (11 weight percent Conradson carbon residue). Typical operating results are shown in Table 16.

The reactor used in these tests had a diameter of 11.25-in., and operated with 9 to 16-ft coke beds. Oil feed space velocities were approximately 3 gal per cu ft per hr, corresponding to gas yields of about 700 MBtu per cu ft per hr.

With crude oil and heavy fuel oil, the carbon laydown was less than one-half of the Conradson carbon residue of the feedstock. With the present design, difficulties from agglomeration in the fluid bed, or blockage of the internal coke recycle system, have been eliminated. A 1000 Mcf per day pilot unit is now being tested. In this unit, hydrogen will be produced by catalytic reforming of recycle product gas.

The Institute of Gas Technology has studied the production of high-Btu gas in both batch and flow reactors. The flow reactor is 3-in. ID with an internal length of 36-in. When distillate oils are fed, the preheated hydrogen-oil mixture is introduced directly into this reactor. When residual oils are fed, however, the preheated hydrogen-oil mixture is first passed downward through a pre-hydrogenation reactor containing commercial cobalt molybdate hydrocracking catalyst. At 850 to 900 F and 35 to 100 atmospheres, the feed is converted to a prehydrogenated product with negligible Conradson carbon residue. The liquids and gases (mostly unreacted hydrogen) making up the prehydrogenated product are passed directly into the hydrogasification reactor. Typical operating results are given in Table 17.

Processing conditions for a wide variety of feedstocks can be adjusted to yield gases of approximately 900 Btu per Scf that consist largely of methane, ethane and hydrogen. Liquid products are relatively low-boiling and highly aromatic, containing more than 50 weight percent of benzene. Complete conversion to high Btu gas does not appear to be practical. Liquid-product formation, however, is reduced to only a fraction of that obtained in conventional cyclic operation. Recent tests have indicated that with residual feed oil, carbon deposition in the hydrogasifier can be controlled with 75 to 100 percent of stoichiometric hydrogen feed. Carbon deposition on the hydrocracking catalyst will, however, require periodic regeneration by burnoff.

Net oil and fuel costs estimated from the experimental results reported in Table 17, on the basis of unit prices and credits employed in cost analyses of the Hall and TPC processes *(see Tables 10 and 14)*, are similar to the equivalent costs of these other oil gasification processes. Process steam and power requirements for high-pressure hydrogasification will be relatively high, and depend greatly on the method of hydrogen production.

A large portion of these requirements, however, could be met by recovery of the large quantities of exothermic heat of reaction and other waste heat. If hydrogen compression is required, some of the cost could be credited to the production of high-pressure gas which can be introduced directly into a transmission line or storage field. No reliable estimates of equipment cost are available at present, but it is quite apparent from available information on hydrogen production and hydrocracking plant costs that it would not

what does

$$\triangle F/A = \triangle p$$

mean to you?

(Continued on next page)

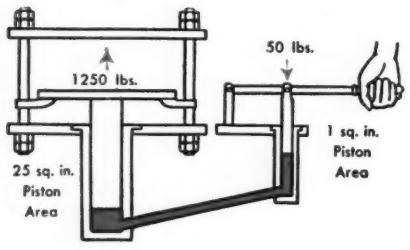
(Continued from preceding page)

$$\Delta F/A = \Delta p$$

. . . is the mathematical expression for Pascal's Principle which states that: "pressure applied to a confined fluid is transmitted uniformly to all areas of the confining fluid."

In the drawing below, notice how a relatively small pressure of 50 pounds applied to the 1 sq. in. piston raised 1,250 pounds on the 25 sq. in. cylinder. Pascal discovered how to multiply the muscles of man a thousand fold! Today, the light touch of a woman's toe against a foot pedal smoothly yet quickly slows and halts a two ton automobile.

Pascal's Principle had been known for hundreds of years when a man by the name of Sven Nordstrom successfully applied the principle to



Here is a demonstration of Pascal's Law. A given pressure of 50 lb lifts 1250 lb over an enlarged area of 50 to 1 ratio

create a most unusual innovation in valves—his invention, the lubricated plug valve. In the most elementary terms, this valve is simply an old fashioned plug cock (used since the days of Pompeii) to which Nordstrom ingeniously applied the Principles of Pascal.

be lower than that of conventional residual oil cracking plants.

Thus, high-pressure hydrogasification seems to be primarily suited for production of a completely interchangeable gas at minimum by-product formation from low-grade, low-cost oils, at high load factor, to supplement either underground storage or winter base load requirements of an existing high-pressure pipeline system relatively near the point of consumption.

Continuous Partial Combustion

The Universal Oil Products Company has developed a continuous process for partial combustion of low molecular weight hydrocarbon fuels at high thermal efficiency and at moderate pressure. The process is autothermic: that is, like the cyclic Koppers-Hasche partial combustion process, it requires no supplemental source of heat to sustain the gasi-

TABLE 17. Hydrogasification of Distillate and Residual Oils at 1500 psig.

Run No.	31	54-A	30-B
Feed Oil			
Type	Diesel oil	Reduced crude	Bunker "C" fuel oil
°API	37.3	21.4	9.9
Carbon/hydrogen wt ratio	6.39	7.04	8.51
Conradson carbon residue, wt %	0	4.4	10.7
Feed rates			
Oil, gal/hr	0.501	0.228	0.199
Hydrogen, SCF/hr	99.2	55.6	45.4
Hydrogen/oil feed ratio			
SCF/gal	198.0	244.2	228.4
% of stoichiometric*	96.0	100.2	73.4
Prehydrogenation conditions			
Average catalyst bed temperature, F	—	910	905
Feed oil space velocity, cu ft/cu ft catalyst-hr	—	0.43	0.38
Hydrogasification conditions			
Maximum temperature, F	1420	1395	1390
Residence time, sec	169	303	422
Operating results			
Total H_2 consumption, SCF/gal	149.4	190.1	185.5
Product distribution, wt, %			
Gas	90.6	90.4	71.7
Liquid	9.4	9.3	27.7
Carbon	Nil	0.3	0.6
Product gas yield			
SCF/gal	195.1	229.3	189.0
SCF/cu ft reactor-hr	674	360	259
Net Btu recovery, MBtu/gal product gas properties	114.3	122.3	94.4
Composition, mole %			
$N_2 + CO + CO_2 + H_2S$	0.3	0.6	0.1
H_2	24.9	23.6	22.7
CH_4	66.5	72.0	72.5
C_2H_6	7.0	3.2	3.9
Higher paraffins	0.1	—	—
C_2H_4	0.2	—	0.1
Benzene	1.0	0.6	0.7
Total	100.0	100.0	100.0
Heating value, Btu/SCF	910	873	891
Specific gravity, air = 1	0.493	0.471	0.480
Product liquid properties			
Gravity, 60 F/60 F	0.951	0.944	0.969
Sulfur, wt %	0.12	0.63	0.17
Free carbon, wt %	0.01	0.12	0.26
Distillation, wt %			
To 160 C	61.3	69.0	60.1
160-200 C	1.0	0.2	1.7
200-300 C	22.5	10.8	14.7
300-355 C	5.7	2.9	3.7
Residue	8.3	15.9	18.6
Carbon/hydrogen wt ratio of 160 C-plus fraction	14.96	16.72	16.77
160 C-minus fraction Composition, mole %			
Benzene	90.1	94.0	94.6
Toluene	5.3	4.9	3.8
Higher Aromatics	4.6	1.1	1.6
Total	100.0	100.0	100.0
Process requirements and oil and fuel costs			
Product gas recycle for Hydrogen production, %†	31	33	37
Process requirements or by-products per net MMBtu of product gas			
Make Oil, gal	8.1	7.5	9.4
Fuel, MBtu**	290	330	390
Liquid Products, gal	0.8	0.8	3.1
Unit prices or credits			
Oil, cents/gal	11	8	7
Fuel, cents/MMBtu	45	45	45
Liquid products, cents/gal	10	10	10
Net oil and fuel cost, cents/MMBtu net product gas	94	67	52

*Stoichiometric for complete conversion of oil to methane.
†Assuming complete conversion of all gaseous hydrocarbons: $C_nH_m + 2n\ H_2O \rightarrow (2n + m/2)\ H_2 + nCO_2$.
**Assuming requirements of 135 Btu per SCF of feed hydrogen, preheat of oil and hydrogen to 900 F at 75% efficiency, and all steam requirements met by recovery of waste heat.

fication reactions at suitable air/fuel ratios. Autothermic cracking of propane to 1000 Btu per Scf gas can be achieved at an air/fuel ratio of about one, and the product gas yields and compositions are similar to those shown in Table 12 for cyclic operation.

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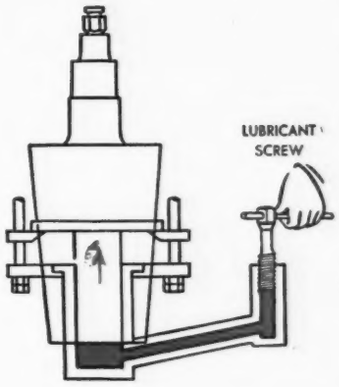
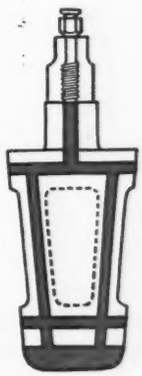
The perfect application of a principle



The lubricant system in the Rockwell-Nordstrom valve is a closed hydraulic system acting much like the two pistons shown on the facing page. Instead of having a separate piston to "charge" lubricant into the valve, the screwed lubricant fitting at the top of the plug acts as the first piston. When lubricant is forced through the fitting by a pressure gun or if the lubricant screw is manually turned down, hydraulic force is magnified and forces lubricant through the channels in the plug.

The plug then acts in much the same fashion as the second piston. A shot of lubricant from a pressure gun or a few turns of the lubricant fitting minutely unseats the plug upwards against the resilient shoulder seal, freeing the plug for smooth, easy turning.



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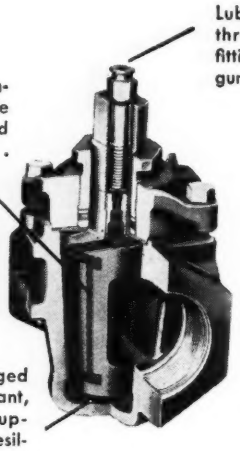
Here's why Rockwell-Nordstrom valves work better, easier and cost less to use, thanks to

$$\triangle F/A = \triangle p$$


Lubricant injected through Rockwell fitting by pressure gun.
Lubricant through channels in plug forms double pressure seal around each valve port . . . leakage eliminated.
Lubricant chamber, charged with pressurized lubricant, counterbalances plug upwards against slightly resilient shoulder seal. Plug can't be stuck in seat . . . instant, dependable operation.

The drawing above shows how lubricant in Rockwell-Nordstrom valves assures the bottle tight shut-off, smooth, easy operation and unmatched dependability that users have learned to expect over the past forty years. Rockwell-Nordstrom, the *original* lubricated plug valve, is also the world's most complete line. They cost no more to buy, often less, than ordinary valves. Whatever your valve needs, there is a Rockwell-Nordstrom valve that will do the job better, longer and at lower cost. If you'd like to know more about these valves or if you'd like to talk with a Rockwell field sales engineer, write Rockwell Manufacturing Company, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited.

ROCKWELL-Nordstrom VALVES

it's ROCKWELL

MANUFACTURING COMPANY

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Dust In Gas Streams

A REPORT ON SUSPENDED PARTICLES IN GAS SYSTEMS

Part 3-B: Recommendations for Sampling

Arnold W. Doyle, Norman M. Wiederhorn, and Arthur Swan*
Arthur D. Little, Inc., Cambridge, Massachusetts

Sampling System

A RECOMMENDED SAMPLING SYSTEM is shown schematically in Fig. 10. Most important parts of the system are the sampling probe and nozzle. This probe should pass through a packing gland, or some other type seal, that permits the insertion and removal of the probe without objectionable gas leakage. A particle detector, such as a filter or light scattering photometer is also shown.

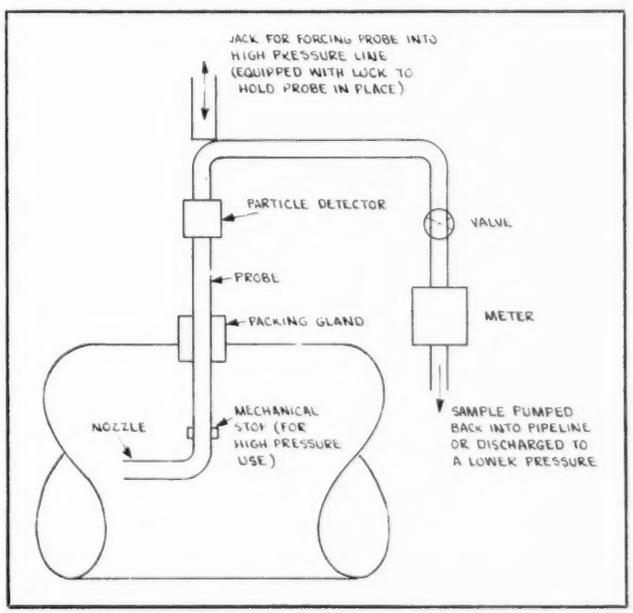
JACK FOR FORCING PROBE INTO HIGH PRESSURE LINE (EQUIPPED WITH LOCK TO HOLD PROBE IN PLACE)
PARTICLE DETECTOR
VALVE
PROBE
PACKING GLAND
METER
NOZZLE
MECHANICAL STOP (FOR HIGH PRESSURE USE)
SAMPLE PUMPED BACK INTO PIPELINE OR DISCHARGED TO A LOWER PRESSURE

Fig. 10. Recommended sampling system.

The system should contain a valve, preferably downstream of the detector, in order to control the rate of sample flow. The sample should be metered before being returned to the pipeline or discharged to the atmosphere. The sample may be moved through the system by one of three mechanisms—a pressure pump, discharge of the sample to a line at lower pressure, or exhaustion of the sample into the atmosphere.

Two additional mechanical features are required when sampling high-pressure lines. These are a *jacking device* for forcing the probe into the line and a *mechanical stop* on the probe. This stop should be inside the pipe, so that pressure cannot force the probe out through the packing gland in the event that the jacking device should slip. The jack should also be equipped with a lock to fix the probe in position once it has been located at the desired point in the line.

Sampling Point

1. **Location.** The ideal location for a sampling point is along a straight line of pipe where the gas is flowing undisturbed. The point should not be located after any bends or line restrictions, unless it is specifically desired to determine their role in the dust level of the gas. It will be recalled that bends or line restrictions cause disturbances in the gas flow and could cause either the loss or generation of particles that are not actually present in the straight line.

Heavy particles can be lost at a bend by impaction, and a sample taken downstream of a bend would show no heavy particles. A restriction, on the other hand, causes a pressure drop in the line, which produces a cooling effect and may

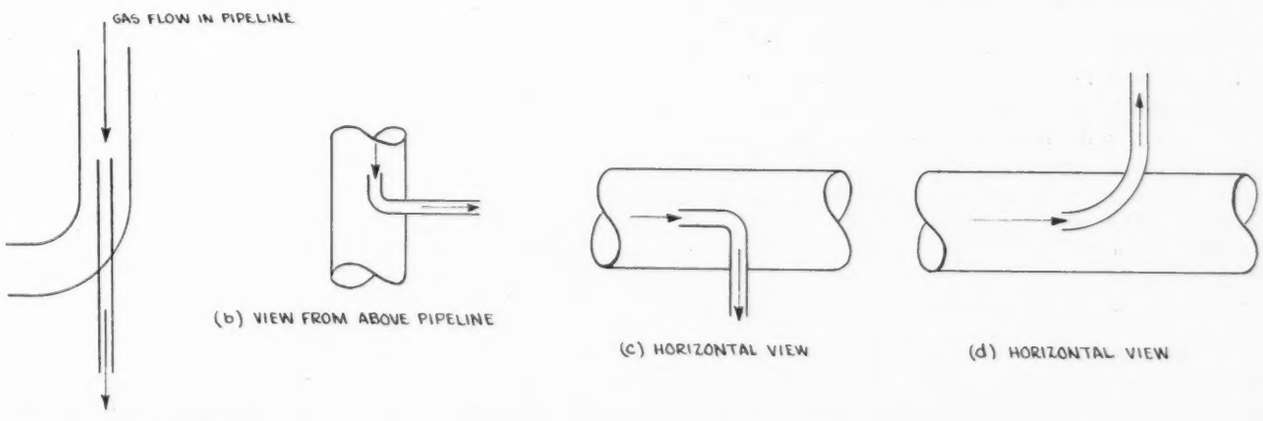

Fig. 11. Sampling point configurations.

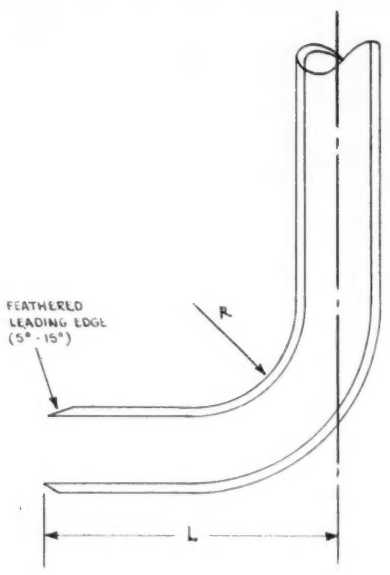

Fig. 12. Recommended sampling nozzle.

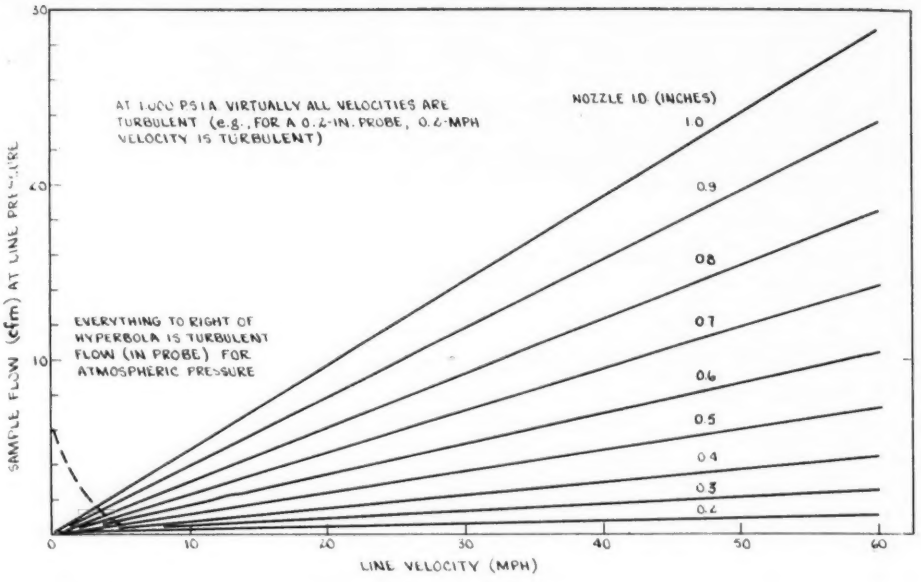

Fig. 13. Volume of flow necessary for isokinetic sampling.

result in condensation. This would introduce spurious particles that are not present in the gas stream ahead of the restriction.

2. **Configuration of the Sampling Point.** Most desirable method of sampling is to remove the sample in such a way that it flows in the same direction as the gas stream without passing through any turns in the sampling line. This may be accomplished by removing the sample with a straight probe at a bend in the line, as shown in Fig. 11-a. This is the preferred configuration since the sample is not required to pass through a turn in the sampling system prior to collection.

The probe should be long enough to project about 10 pipe diameters ahead of the bend, so that local disturbances surrounding the bend will be avoided. This configuration becomes unwieldy for large diameter pipes, for which a 30-ft probe might be necessary. In such cases, this restriction must be ignored, or a sampling point that withdraws at right angles to the gas stream may be employed, as illustrated in Fig. 11-b, 11-c, and 11-d.

In Fig. 11-b the sampling probe is located horizontally. The point must therefore be on the side of the pipe. The advantage of this configuration is that the terminal settling velocities of particles need not be considered, since there are no vertical sections where they might be lost. There is, of course, the problem of settling losses in the horizontal line. In general, this is more serious than settling in a vertical section and every attempt should be made to minimize this error by keeping the horizontal probe as short as possible.

Fig. 11-c and 11-d represent sampling points that use a vertical sampling probe. In the one case, however, the probe is situated below the pipe; in the other, above the pipe.

Sampling from below is preferable for two reasons:

First, any impaction losses at the bend in the sampling nozzle would very likely be partially eliminated.

Second, the problem of maintaining sufficient flow to support particles of all sizes so that there will not be losses in the vertical line is avoided, since the gas flow and the particle settling velocities occur in the same direction. It is realized that in general it will not be convenient to sample with the gas sampling point at the bottom of the pipeline and that frequently the configuration shown in 11-d or 11-b must be used; that is, either horizontal or vertical right-angle sampling. If a choice of these two configurations is available, 11-d is to be preferred.

The Sampling Probe

A suitable sampling probe must be of sufficient strength to withstand the pressure difference between the atmosphere and the pressure in the line. Preferably, its walls should be smooth both inside and out. Internal smoothness will minimize adherence of the particles in the stream to the wall. If a packing gland arrangement is to be used, a smooth exterior wall is desirable to achieve a satisfactory gas seal.

Internal diameter of the probe should be not less than 0.25-in. and preferably greater than 0.40-in. Every effort should be made to maintain a constant internal diameter from the tip of the sampling nozzle to the particle detector. If this condition does not exist, spurious liquid particles may be introduced by slight expansions or compressions of the sample.

The probe should also be as short as possible in order to minimize the settling losses in horizontal runs. Temperature changes of the gas in the probe must be minimized. The latter is quite important, for if the temperature of the probe is not kept as close as possible to the temperature of the gas stream, liquid particles may be vaporized or condensed in the probe and the sample will be in error with respect to such particles.

The probe should contain a minimum number of bends, and preferably none. When designing a sampling probe using a filter, one should remember to locate the filter so that particles will not fall from its face back into the gas stream. This may require one extra bend in the sampling probe line, so that the filter can be laid on its side. A more satisfactory arrangement, of course, would be to use a vertical downward sampling point, so that the filter is oriented properly without any additional bends.

The Sampling Nozzle

As mentioned above, the sampling nozzle should have the same diameter as the probe; however, the nozzle dictates what this diameter should be. It is suggested that the diameter never be reduced to less than 0.25-in. and preferably should be greater than 0.40-in. It has been found that, even when sampling isokinetically, an improper sample is drawn if the nozzle diameter is reduced below a critical value. If the diameter is greater than 0.40-in. and sampling is isokinetic, a proper sample should be drawn into the nozzle. A sketch of a sampling nozzle is given in Fig. 12.

Summary of Sampling Errors

Source of Sampling Error	Type of Error Introduced	Particle Size Concerned	Importance of Effect	Action for Best Sampling
1. Flow at nozzle entrance	a. Too high an indicated concentration when the sample is drawn at a rate less than isokinetic.	Large	Very	Sample isokinetically.
	b. Too low an indicated concentration when the sample is drawn at a rate higher than isokinetic.	Large	Very	Sample isokinetically.
2. Bends in the sampling piping	Loss of particles due to impaction at the wall.	Most serious with large	Very	No bends in sampling system. (Sample at an elbow.) Sample at low velocity.
3. Brownian motion	Loss of particles due to impaction at the wall.	Small	Slight	Minimize length of sampling system.
4. Turbulent impaction	Loss of particles due to impaction at the wall.	All	Unknown	Sample so that the sample flow is streamlined whenever possible.
5. Settling	a. Loss of particles in vertical sections of piping.	Large	Slight	Eliminate vertical piping from sampling system.
	b. Loss of particles in horizontal sections of piping.	Large	Very	Keep flow in sampling tube turbulent or minimize length of horizontal sampling tube.
6. Condensation or evaporation	a. Increase or decrease of liquid suspensoid concentration caused by adiabatic expansion or compression of the sample.	All (Liquid Particles)	Very	Eliminate regions of sample expansion or compression from the sample piping. Use minimum length of smooth wall tubing. Have no flaring out or tapering in of the nozzle entrance.
	b. Increase or decrease of liquid suspensoid concentration by heating or cooling the sample.	All (Liquid Particles)	Very	Do not heat or cool the sample.
7. Diameter of sampling nozzle	Indicated concentration of suspensoids too low.	Large	Very	Keep nozzle greater than 0.3-0.4-in. ID
8. Probe direction	Indicated concentration too low when poorly directed.	Large	Very	Point nozzle upstream at all times.
9. Probe location in duct	If stratification of suspensoids occurs in the duct, samples taken at various points will yield different results.	All	Nil if flow is turbulent.	Traverse the line if flow is streamlined; otherwise, sample at any point away from the extremes of the pipe.

The leading edge of the nozzle should be feathered to minimize turbulent effects. The feathering should be done from the outside in order to preserve a constant internal diameter. The angle of feathering is preferably 5 degrees; however, 15 degrees is acceptable, provided the wall thickness of the probe is not excessive. It has been postulated by Watson and Griffith and Jones that the reason for the sampling errors for small diameter nozzles is the bluffness of the probe.

A measure of bluffness is the ratio of the area of the wall of the nozzle to the area of the aperture of the nozzle. Values from 0.35 to 1.25 have been used without this effect being noticeable; it is recommended, however, that the ratio be less than 1.0 whenever possible. The radius of curvature of the inside of the bend (R) should be equal to, or greater than, 0.5-in. It is realized that short curvatures are often necessary to permit the entrance of the nozzle through a valve and into the pipe. If curvatures less than 0.5 in. are used, however, impaction losses at the sharp bend may be excessive. Whenever possible, it would be desirable to increase the radius of curvature to 2 or 3-in.

Sampling Procedure

Samples should be drawn isokinetically. Fig. 13 shows the probe flow necessary for isokinetic sampling with various size nozzles; the sampling volume in cubic feet per minute is plotted against the line velocity in miles per hour. Once the line velocity is known, this chart may be used to select a convenient volumetric sampling rate and nozzle diameter. The sampling nozzle size and isokinetic flow requirements specify the volumetric rate of flow.

Fig. 5 *(in Part 3-A, American Gas Journal, April, 1959)* shows the expected loss by impaction at a bend for various volumetric rates of flow in sampling nozzles of different sizes. This figure should be consulted also before choosing the volumetric rate of sample withdrawal, so that impaction losses will not be greater than is necessary.

Finally, the probe should face into the gas stream at all times. When it is rotated, errors are introduced.[8]

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* * *

Safeguard for plastic pipe while being carried on compressor truck is to insert and transport pipe lengths into 1½-in. steel pipe. Plastic pipe is shown being loaded for delivery to installation site.

Plastic pipe joint is made up on sidewalk before being inserted into old steel service. Sleeve and outside of tubing are swabbed with thinner and sleeve coated with cement to effect secure joint.

As new types of material become available for use in the gas distribution industry, it is necessary to develop economical and proper methods for handling, storing, control, and issuance of such items; here's how The Peoples Gas Light and Coke Company controls

Plastic Pipe Storage, Handling and Use

H. E. Wade, *General Storekeeper*
The Peoples Gas Light and Coke Company
Chicago, Illinois

HANDLING AND STORAGE of all types of material is a major function of the stores department of The Peoples Gas Light and Coke Company. In the fall of 1952, this department was introduced to an item entirely different from any other that had previously been stocked. The company's distribution department, after several months investigation and field tests in conjunction with the engineering department and the testing department, decided on the use of plastic pipe for insertion renewals of faulty 1½-in. steel, low-pressure services.

Prior to that time — on any steel service pipe that had rusted out or was to be changed due to age — it was necessary to pull the old pipe out, using a jack and much arduous labor, and to replace the defective pipe by jacking in new steel pipe. Before the plastic pipe is inserted into the old steel service pipe, the ends are joined together until the desired length is obtained. The lengths are joined with an 8-in. long sleeve made of the same material with an OD of 1.249-in. plus or minus .002-in. The pipe fits into a brass compression type fitting specially made for this operation.

Present specifications for the plastic pipe, known as virgin clear cellulose acetate butyrate, are as follows:

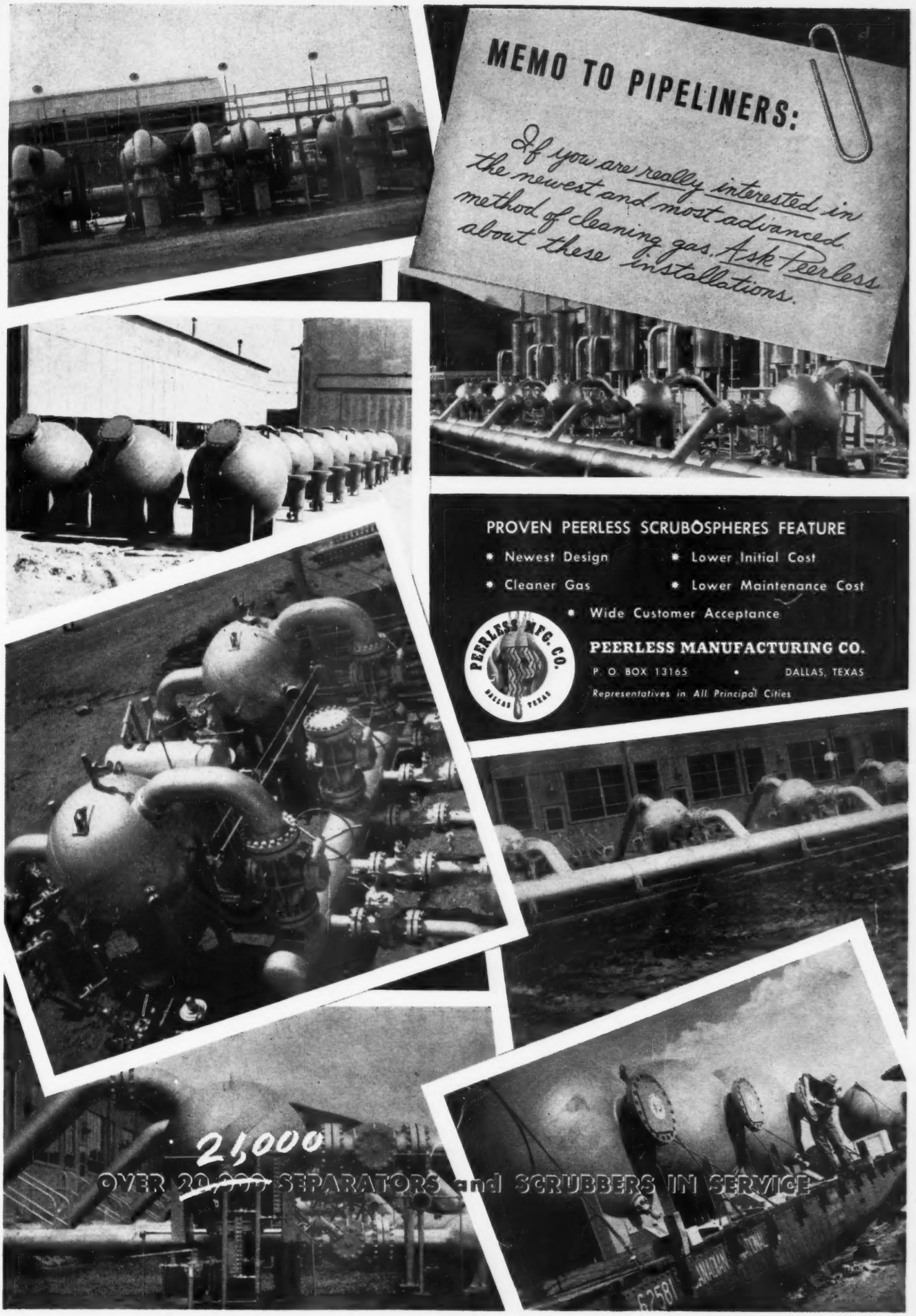
Outside Diameter	1.375-in.	± .003-in.
Wall Thickness	.062-in.	± .003-in.
Inside Diameter	1.251-in.	± .003-in.
Length	20 ft	± 1.0-in.

"Spec" Control Procedure

Adherence to rigid specifications set up for the plastic pipe and sleeves necessitated the installation of a rigid control procedure by the stores department. Occasionally, either the inside diameter of the pipe or outside diameter of the sleeves, or both, were found to exceed allowable tolerances.

In either case this condition could prevent a proper fit of the sleeve into the pipe or would not permit the sleeve to enter the pipe. Storekeepers were instructed to spot-check each delivery by testing the fit of the sleeve into the pipe. This did not prove to be a very satisfactory method, due to the fact that allowable tolerances in 1952 and 1953 were .007-in. compared to the .003-in. tolerance used today.

A program was worked out with the suppliers whereby they would manufacture 20,000 to 30,000 ft of pipe at one time and an engineer from the utility's testing department would spot-check the entire run at the plant. As a result of this close cooperation between the manufacturer and the test-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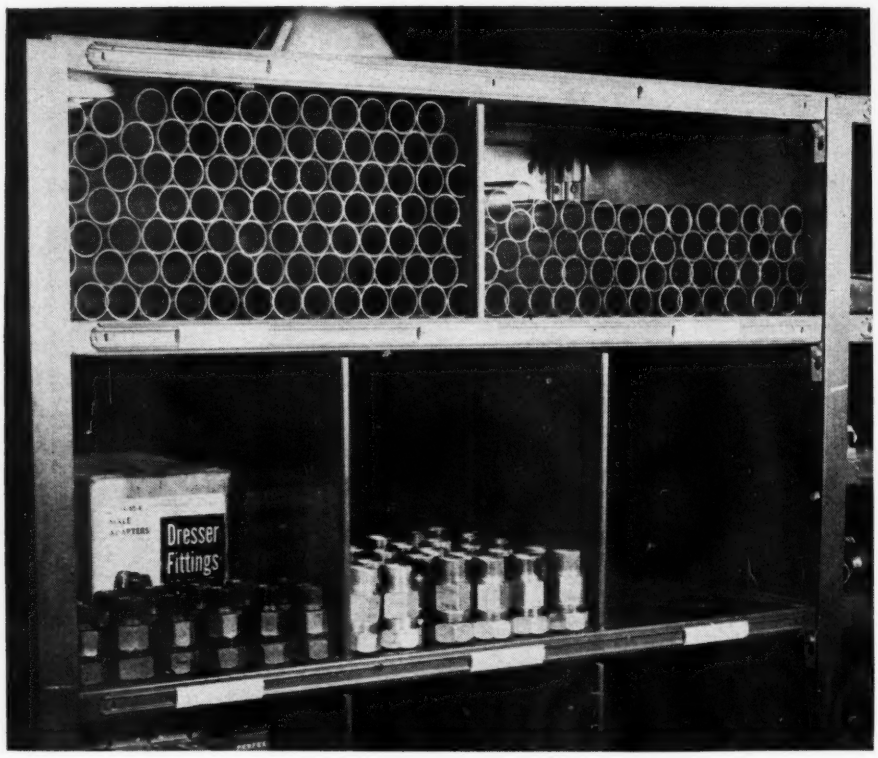

8-in. plastic sleeves are stored in standard storage bins at the warehouse, as shown at right. **20-ft lengths of plastic pipe,** 40 joints to a package, are stored in original shipping cartons until needed. Pipe is disbursed on "first in, first out" basis.

ing department, the allowable tolerances were reduced to .003-in. The manufacturer also agreed to make a 100 percent check on the sleeves; in the past three years, no trouble has been experienced.

Ordering and Issuing Procedures

Contracts are now alternated between two suppliers, both located in Chicago, and orders are for 100,000 ft per contract. Pipe is delivered on shipment releases, as required, to eight storerooms from which the pipe is issued. The main shops order 10,400 ft and the sub-shops 2400 ft at a time. This represents anywhere from three to eight weeks supply at each location. Approximately 4500 sleeves are used for each 100,000 ft of pipe, and they are all ordered into the warehouse at one time and supplied to the shops and sub-shops as required.

Following the inception of the use of plastic pipe in December 1952, issues per year have been:

1953	190,000 ft
1954	272,000 ft
1955	275,000 ft
1956	478,000 ft
1957	280,000 ft
1958	352,000 ft

Storage Procedure

The plastic pipe is delivered in heavy corrugated cartons, each containing 800 ft. The pipe can be stored either indoors or outdoors, as tests have proved this material retains its elasticity and rigidity even when subjected to prolonged periods of heat or cold. It is not recommended, however, that the pipe be stored for periods in excess of six months. The cartons should not be stored more than four high. Present procedure is to open and issue from one carton at a time for two reasons,

1. This system permits us to follow a first in, first out procedure for issuing the pipe, and
2. Retain the balance of the pipe in heavy corrugated cartons protects the pipe against damage.

Prior to the introduction of plastic pipe for service renewals, hard drawn copper tubing had been used for the same purpose. Not only have tremendous savings been realized on the cost of the plastic pipe versus the copper pipe (12 cents per ft as contrasted to 53 cents per ft), but also on installation labor costs, since the plastic pipe makes a much simpler installation.

Acknowledgment

This article was prepared from a presentation made at the 1959 American Gas Association Distribution Conference.

* * *

Before plastic renewal is inserted into old service line, all rough edges must be removed from the steel service pipe to prevent cutting of plastic.

After rough edges are removed and main is clear, new plastic service is inserted. Whenever possible, installation is made from inside building.

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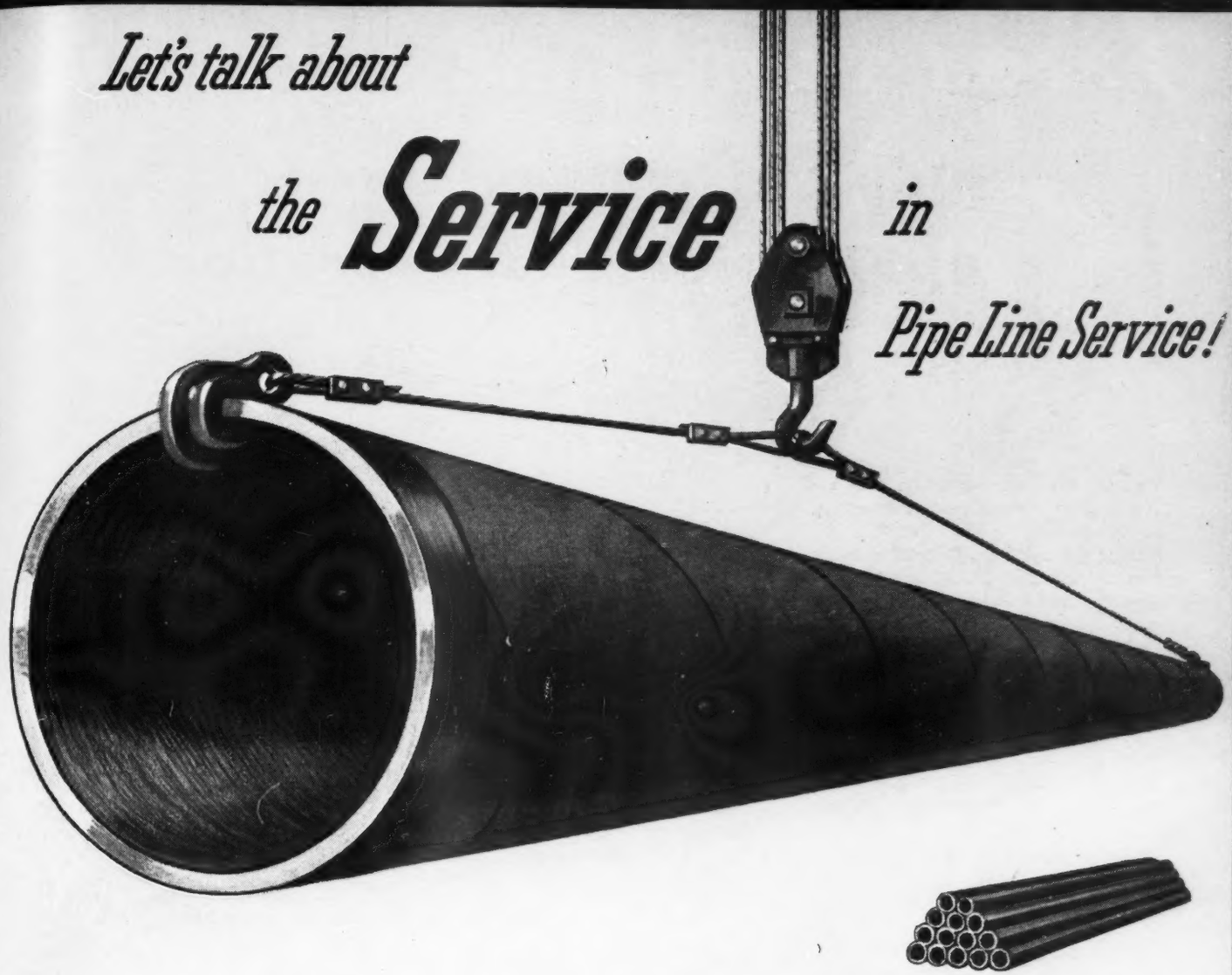

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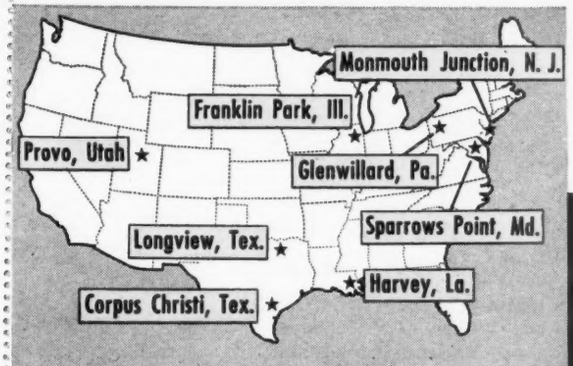

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Plug Valve Regulators: *Application and Operation*

Howard J. Evans
Rockwell Manufacturing Co., Du Bois, Pennsylvania

THE ORIGINAL GAS PRESSURE REGULATOR was an integral unit of a weight, diaphragm, and globe valve for controlling the pressure. To obtain fairly accurate control, the valve construction of such a unit had to move with a minimum of friction. Development of auxiliary pilot regulators and nulbalance instrumentation has multiplied the amount of pneumatic force available for positioning valves and thereby reducing necessity for having a friction-free construction of control valve.

Plug valves have been used in the gas industry for many years. Mainly, these valves have just been used for shut-offs but in some cases they have been used for throttling gas and, in such use, have proved to be quite satisfactory both from an erosion standpoint and for stable operation. About 20 years ago some gas companies, particularly on the West Coast, began using lubricated plug valves as pressure regulators. With the development of proper instrumentation and pneumatic and hydraulic operators, application of plug valves as controllers has become more popular.

The systems used for operating the plug valve regulator have varied; some companies have used piston operators, others have used air motors. Both hydraulic and pneumatic systems have been used. Instrument type pressure controllers of different types have been used along with small diaphragm operated valves and valve positioners.

One of the simplest systems is shown in the accompanying diagram. This system can best be described by considering it as having four primary elements:

1. **Plug valve**
2. **Valve operator** (power unit)
3. **Valve positioner**
4. **Pressure controller** (pilot instrument)

Supply pressure is controlled at a different pressure for the controller and for the valve positioner. A normal 18 psi pressure is available for the controller but a 50 psi or higher pressure is supplied to the valve positioner. The gas supplied to the positioner must be high enough for the piston to turn the valve. This gas also travels through a lubricator so as to continuously lubricate the piston rings.

The **pressure controller** is identical to the instrument used on the conventional diaphragm operated valve, having a 3 to 15 psi output pressure. The instrument can have either a proportional band or proportional band plus automatic reset.

The **valve positioner** is different from the usual positioner in that it contains a three-way valve so that pressure can be transmitted to either end of the piston cylinder. The use of a rotary motion between the plug valve and the positioner allows the use of a cam so that any desired valve characteristic can be obtained.

With the use of a **piston type operator** it is possible to position the valve in the best or safest position in case the supply pressure is lost. With the proper instrumentation the loss of supply or instrument pressure can cause the plug valve to either remain in position or go fully open or closed. The possibility of designing the system to cause *"fail in position"* is often a big advantage.

Plug Valve Features

Plug valve has many features that make it ideal for use as a control valve. One of the most important is its ability to achieve tight shut-off. To obtain a tight shut-off with a conventional regulator means the use of soft seats having limited usage or the use of single seated valves that have high unbalanced forces.

The plug valve offers the advantage of a tight shut-off along with very little unbalance of force normally caused by the pressure drop. Because the opening in a plug valve has tapered sides, the initial opening is in the form of a triangular slit. The first 15 percent of opening has a valve characteristic similar to the conventional-ratio plug. This provides greater range for the plug valve regulator.

Unbalanced forces created by flow through a plug valve are relatively small. This is of extreme importance in high-pressure regulation and with large volumes. The conventional double valve regulator has much higher unbalanced forces that cause instability. The direction of unbalance in a conventional regulator changes with amount of valve opening, causing additional instability.

Straight-through flow in a plug valve is one of the reasons for the relatively high capacity particularly at low-pressure drops. This also explains their use on lines where the valves remain in a wide open position during peak loads and act as pressure limiting devices to protect the downstream line during the off load periods.

Although the turning torque of a plug valve is relatively high, it is fairly uniform. Since no unbalance is caused by flow the percentage change in operating force throughout its total travel is much less than on a conventional regulator. No counteracting springs or weights are necessary, which means a reduction in mass inertia and further insures stability.

The standard plug valve has a heavy construction to insure that it will not distort under pressure. This heavy wall construction is of definite advantage in case of erosion due to dirty gas. Undoubtedly, excessive amounts of pipe scale, etc., carried with the gas can cause failure of a plug valve regulator. For this reason, it is recommended that block valves be used around the plug valve regulator that is a continual service. Experience has shown, however, that the plug valve regulator can operate 10 to 20 years in natural gas without any maintenance other than lubrication.

Noise Problems

One of the general problems in gas distribution operations is control of noise from regulator stations. The regulator station that used to be outside of the town is now surrounded by

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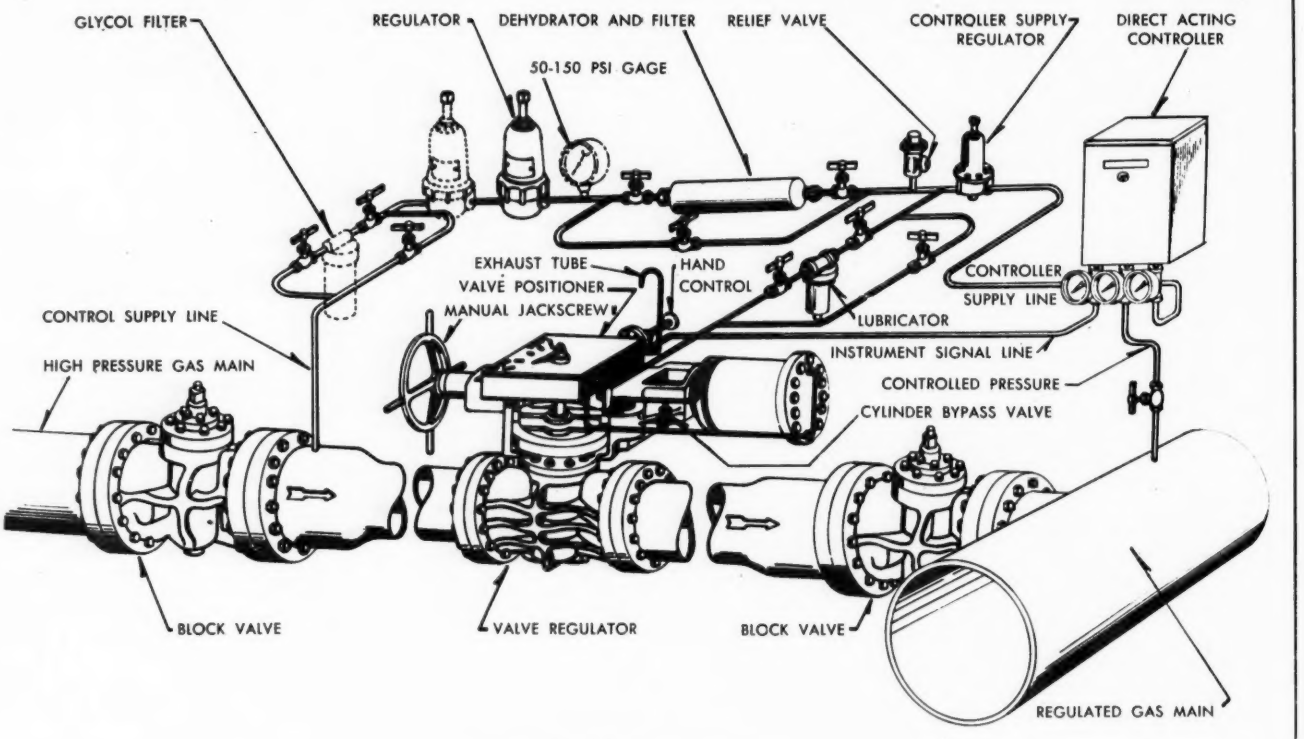

Typical Valve-Regulator Installation.

houses. Gas flowing through any throttling device is going to make noise.

In some installations the plug valve seems to be quieter than the conventional regulator; in other cases, it causes as much or more noise.

The best solution seems to be to bury the valve and use a valve extension to the ground service. This has proved very satisfactory because of the low maintenance necessary on the plug valve, and does insure quiet regulator stations.

The use of a buried valve also reduces the cost of the installation since the building size can be materially reduced or eliminated.

"Lost Motion"

In any type of regulator, care must be taken to have the minimum amount of lost motion between the valve and the operator. This lost motion will cause a "hunting" regulator, particularly if an automatic reset type of control is being used. Particular care must be taken to insure this elimination of lost motion. Standard valve operators quite often have excessive play.

Limitations

About the only limitation of the plug valve regulator is the requirement for sufficient pressure for the piston to operate the valve. This is actually an economic consideration because of the necessity of using extra large piston operators in case of low pressure. Normally, 50 psi is considered the lowest pressure, but in some cases pressures at 10 and 20 psi have been used.

Another limitation — from an economic viewpoint — is size. The relative cost increases as the size decreases. This tends to be true in any type of pressure regulator using instrument control, but is even more true on plug valve regulators because of the cost of the operators.

Response Rate

In some applications, the response rate becomes important. This characteristic can be varied some by changing either the operating pressure on the piston or by changing the size of the valve in the valve positioner. The response rate cannot be made as rapid as occurs on the simple spring actuated regulator, but can approach the speed of any conventional regulator having instrument control.

Other Features

Any plug valve that has been maintained in good operation condition can be converted to a regulator. This leads to the obvious application of using plug valve regulators as monitors for greater operating safety. Both the block valves on conventional regulators or the valve in the by-pass line can become monitor regulators to protect against "over" or "under" pressure.

Because of its large capacity, the plug regulator is well adapted for use as a **relief valve.** The main limitation is having sufficient pressure available to operate the plug valve. It has been used as a relief valve on low-pressure distribution systems when a high-pressure gas was available.

A flow control station usually requires a control valve which offers a minimum amount of pressure drop. The venturi type plug valve has very little overall pressure loss when in a wide open position. For this reason, a plug valve used as a flow control regulator has the extra large capacity normally needed.

The plug valve regulator is still quite new and undoubtedly further field experience and development will extend the use of unit. The present regulator is a direct adaptation of the plug valve which has been used for years as an "off and on" valve. With its new role as a control valve some modifications will undoubtedly be made.

Acknowledgment

This article adapted from a presentation made at the 1959 A.G.A. Distribution Conference in Cincinnati, Ohio.

* * *

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Take hold of just two control levers and you're in complete command of all movements of boom, bucket, and dipper stick on this John Deere Backhoe! You save the lost motion of switching from lever to lever; you get smooth, efficient operation even in cold, heavy-glove weather. Stabilizer controls are between the operating levers.

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DISTRIBUTION DEVELOPMENTS

NEWS ABOUT CURRENT AND PLANNED CONSTRUCTION

Lone Star Gas Company's new $25,000 Dallas central service filling station dispenses gasoline from two 8000-gal underground storage tanks, LP-Gas from a 2000-gal tank located approximately 250 ft from the station, or kerosine from another underground storage tank with a capacity of 1000-gal. Five oil containers with hand operated pumps dispense different types and weights of oil; and a new air pump that allows the pressure to be set to a pre-determined amount and when the tire has been inflated to this level a bell rings, and the air flow is automatically shutoff. In keeping with the modern architecture of the service building, the filling station has a slanting roof angling upward from the center to form a "Y" with the building as a base. This design keeps the building small, yet allows large trucks to pass under the roof on either side.

Central Hudson Gas and Electric Corporation, Poughkeepsie, New York, has several major construction projects scheduled for 1959. These include installation of more than a half mile of 8-in. medium pressure main to supply natural gas to the City of Kingston, construction of a new regulator station, and expansion of the North Kingston regulator station at a cost of $100,000. Another $400,000 has been budgeted to extend natural gas service to new residential, commercial, and industrial customers throughout the system. Numerous other small construction projects are also scheduled for 1959. On January 5, 1959, Central Hudson set a new record daily gas sendout of 22,049,000 cu ft breaking the previous record sendout of 21,243,000 cu ft set February 17, 1958.

Michigan Consolidated Gas Company, Detroit, Michigan, has set a record construction budget of $34,000,000 to be spent in 1959 for new gas facilities. Company's budget is 75 percent higher than 1958, but only $300,000 higher than the previous record budget of 1956. Largest single item in the 1959 budget is a projected $17,800,000 for additional compressors at the company's underground storage fields and an additional large diameter line to deliver gas from the storage fields to the Detroit City Gate. More than 189 miles of new mains will be laid by Michigan Consolidated throughout the state including 78 miles in the Detroit area at a cost of $11,900,000; 30 miles of mains in Grand Rapids at a cost of $1,780,000; 23 miles of mains in Ann Arbor district at a cost of $840,000; 21 miles of mains in Muskegon at a cost of $550,000, and 37 miles of mains at a cost of $1,130,000 in the northern district cities of Big Rapids, Cadillac, Greenville, Belding, Ludington, Mt. Pleasant, and Traverse City. Approximately $800,000 will be spent this year for planning and preparation of a proposed $20,000,000 central office building in Detroit. Building is expected to be completed in the summer of 1962. $815,000 has been tabbed for relocation of mains and services resulting from public improvement and building of expressways, mostly in the Detroit area.

Southern California Gas Company, Los Angeles, California, added more than 30,000 new customers during 1958. For the sixth consecutive year, the San Fernando Valley Division lead all other company divisions in total growth adding nearly 10,000 meters. Total meter growth during the year was 30,606 to bring the number of customers served by SoCal to an all-time high of 1,647,118. Eastern division was second highest division in the company with 6879 new customers added.

New Frontiers for Natural Gas — from Canada to Karachi (left). A 10-in. distribution line is being installed in the heart of Waterloo, Ontario by contractor crews for Union Gas Company of Canada as part of an expansion project to bring natural gas to eight new communities. More than 95 miles of 2 to 10-in. lines have been laid as follows: Goderich, 30 miles, Clinton, 15 miles, Seaforth, 10 miles, Mitchell, 12 miles; Sebringville, 1.5 miles; Dublin, 1.5 miles, Amherstburg, 25 miles, and LaSalle and surrounding area, 20 miles of main. Construction work is being done by four contractor crews: Harvey B. White, Ltd., G. I. Russell and Company Ltd., McDale Ltd., and J. W. Cain Ltd.
(Right) Across the world, a welder completes another new distribution main laid along Frere Street in the busy heart of Karachi, Pakistan. More than 600 consumers are now using natural gas from the Sui field. In 1959 Karachi Gas Company expects to add another 2000 consumers as lines are extended in Mary Road, Somerset Street, Preedy Street, Empress Market, and in parts of Nazimabad.

Southern Counties Gas Company, Los Angeles, California, has started construction of a 13.5 mile 30-in. supply main from Santa Ana to Southern California Edison Company's Huntington Beach steam electric generating plant. Pacific Pipeline Company of Los Angeles is contractor on the project, scheduled for completion May 1, 1959. Project includes installation of 71,165 ft of 3-in. at a cost of $1,645,000 to deliver 199,200,000 cu ft of gas per day to the Edison plant. Line will cross under the Santa Ana River, as well as the right-of-way of the future Golden State Freeway to San Diego. Edison Company is advancing $639,000 to aid in construction of the new line. The Edison plant, which has used oil-burning equipment as its major source of energy, is currently receiving a portion of its gas requirements from the 12-in. Huntington Beach-San Diego pipeline. When the new line from Santa Ana is completed, service to Edison from the 12-in. line will be discontinued.

Arkansas Western Gas Company, Fayetteville, Arkansas, plans to extend its service lines to serve Highfill at an estimated cost of $64,000. City has voted to issue revenue bonds and construct the natural gas facilities. Arkansas Western will lease and operate the new system and have the option to purchase the system for outstanding indebtedness any time during the term of the lease. Natural gas service has been completed to Pea Ridge at a cost of approximately $158,000. The distribution system, constructed by the City of Pea Ridge out of revenue bonds, has been completed.

Long Island Lighting Company, Mineola, Long Island, New York, plans to spend $12,000,000 for construction and development of its gas distribution system in 1959. Major budget items include $8,000,000 allocated for larger distribution mains to bolster growing gas spaceheating demands; and $4,000,000 for plant construction. Gas lines will also be extended into areas of Suffolk where farms are gradually turning into residential and industrial and business areas. LILCO's gas sendout for 1958 totalled 15,000,000 Mcf, contrasted with 1948 when sendout was 6,000,000 Mcf—an increase of 150 percent in 10 years. Recently completed was a new $950,000 area headquarters and service center in Greenlawn. Situated on part of a 150-acre site on Pulaski Boulevard in Greenlawn, the new service center will house office staff and be the report center for service personnel.

fast, rubber-tired Side Boom handles many pipe line jobs

Equipped with a SUPERIOR-HOUGH hydraulic side boom, the "PAYLOADER" tractor-shovel provides you with a handy, versatile crane, for unloading or loading pipe; stringing and lowering-in; holding for coating, wrapping or welding; handling valves and supplies. With its bucket it can be used for backfilling, clearing and loading out excess spoil.

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The boom has complete hydraulic control and power — lifts up to 10,000 lbs. at 4′ overhang. Boom telescopes from 10 to 16 feet. Cable drum has free spooling safety release.

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Huge rubber tires provide sure-footed traction and flotation in sandy and muddy soils . . . and prevent damage to paved surfaces and landscaping along right-of-way. It's fast to the job (travels over streets, highways or cross country) and fast on the job. No trailer required.

A fast loading and unloading crane out on the job or in pipe pre-coating areas. Does not damage paved surfaces. Ideal for stringing on paved surfaces or cross country. Trench-hoe, winch, black-top spreader, and many other attachments.

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Speedkote and Speedwrap, two new **GLASFAB**® BRAND products designed specifically for fast set-up time, are the latest additions to the Midwestern line.

SPEEDKOTE is a quick-set asphalt with excellent adhesive properties, high dielectric strength and good soil and mar resistance. Speedkote may be brushed, trowled or sprayed on the pipe. Drying time is approximately 30 minutes per coat.

SPEEDWRAP is a prefabricated pipe joint cover made of one ply of "Glasfab" and 25# bitumen (either asphalt or coal tar) laminated to a sheet of 90# polyethylene faced kraft paper. Speedwrap comes in 18" and 24" widths and is pre-cut in lengths to fit the pipe being wrapped.

Speedkote and Speedwrap are the two latest developments in Midwestern's field-proven "Glasfab" line. The original "Glasfab", a wholly inorganic loom-woven glass fabric, has proved to be an ideal handwrap for pipe joints, extensions, hot spots and holidays . . . with either hot or cold applied coatings.

A Midwestern representative would like to show you the advantages of new Speedkote and Speedwrap. For complete details contact the Midwestern Man nearest you . . . TODAY!

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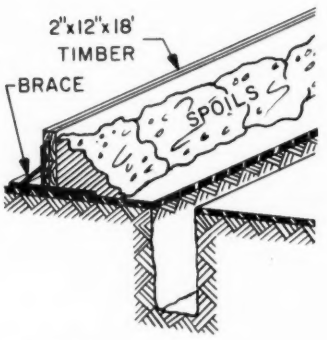
- Oklahoma City, Okla.
- Des Moines, Ia.
- New York, N.Y. (export)
- Caracas, Venezuela

Atlanta Gas Light Company, Atlanta, Georgia, has scheduled the largest construction budget in the company's history for 1959 — $10,400,000 — for new facilities to serve approximately 19,500 more customers. About two-thirds of the construction budget will be spent in a six-county area near Atlanta to add 12,000 new customers, complete expansion of the Riverdale peak shaving plant, and extend service to Gwinnett County. Other major budget items are: $500,000 to add 1300 customers and improve the peak shaving plant in Macon; $500,000 to add 1500 customers in Augusta; $325,000 to add 450 customers and make pressure improvements in Rome; approximately $500,000 to add 750 customers and complete extension of service to Watkinsville in Athens; $90,000 to add 300 customers in Valdosta; nearly $200,000 to add 500 customers and improve facilities in Griffin; and $140,000 to add 200 customers and upgrade facilities in Carrollton. Company is currently working on and plans to complete by spring a line to Duluth and Suwanee. Distribution and service

IDEA AT WORK



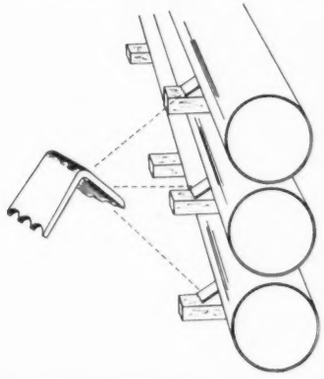
Retainers Keep Spoil In Place

When trenching in areas where it is necessary to keep the trench spoil confined closely to the working area, spoils retaining boards, such as the ones used by Arizona Public Service Company and shown in the accompanying drawing can be used to advantage. Braces are fabricated from ½-in. by 3-in. mild steel, welded as shown. Side boards are 2-in. by 12-in. by 18-ft timbers. Timbers can be bolted to braces and at lap joints, an extra-long bolt can serve to tie together two ends.

work is being done inside the city of Duluth. This is in connection with expansion work in Gwinnett County. Company has completed service work in Winter Chapel, Norcross, and Liberty Heights.

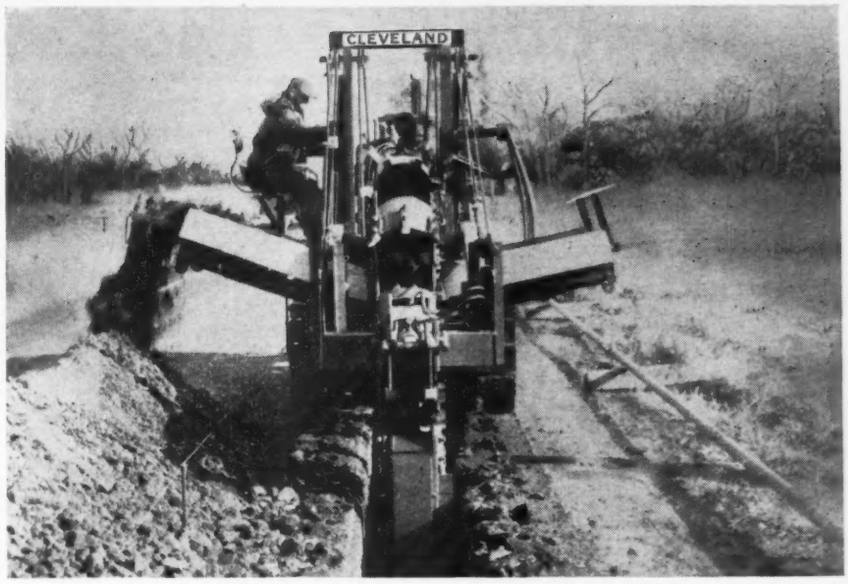
Washington Gas Light Company, Washington, D. C., plans to spend approximately $15,000,000 on plant and facilities in 1959, a substantially greater investment than any single year in the company's history. Included are plans to extend service to new areas in Fairfax, Loudoun, and Prince William counties in Virginia, as recently "okayed" by the State Corporation Commission. During 1958, WGL spent more than $11,600,000 on facilities and equipment to supply 13,000 new customers and meet increased demand for gas by present customers. Gas sales increased 12 percent over 1957 and reached a total of 425,000,000 therms — highest in company's 110 years of operations. WGL is seeking necessary approvals to proceed with its Brandywine, Maryland, underground storage so project can be in limited operation by the winter of 1961-1962.

IDEA AT WORK



Pipe Clips Speed Pipe Racking

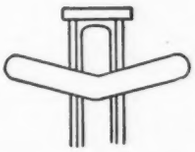
Cumbersome wood blocks and time-consuming hammering and nailing can be eliminated when stacking pipe of any size from 3-in. OD or larger with a simple, easy-to-use pipe clip now commercially available. The clip was developed by a pipe and steel supply company for its own warehousing operations. Reusable, the clips are made from steel, are ¼-in. thick, 2-in. wide, and form a 3-in. by 3-in. 90 deg angle, and weigh ¾-lb each. One tap of a hammer holds clip in place. Weight of pipe is actually sufficient to keep the clip in place.



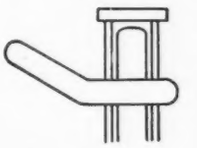
Cleveland "J" digs 20'/m through scored pavement

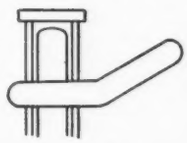
This Cleveland J-20, digging for 4 and 6-inch pipe on a Colorado utilities job, averaged 20 feet per minute as it cut through scored pavement and 8 inches of frost. Note the clean neat cut through paving and frost. Contractor's report indicates he was particularly pleased with the J-20's easy maneuverability as well as its high production on this job. *All* operations of the J-20 are controlled at the operator's seat.

V Conveyor
...permits faster, higher spoil discharge, higher heaped loads without clogging.



Hydraulic Conveyor Shift
...permits digging past poles, trees, etc., without interrupting other operations.





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...optional, extra... pivots upward... allows setting wheel to required depth at walks, drives, underground obstructions.

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MATERIALS – EQUIPMENT – SERVICES

BARBER-GREENE'S MODEL 774 WHEEL DITCHER can now be equipped with a wheel to dig to a maximum of 30 in. wide and 7 ft deep. Standard model digs to 5 ft 6 in. Unique spoil conveyor brings operating economies to user of B-G ditcher in those applications where excavated material must be removed, and a backfill of sand or gravel applied. Conveyor design of the 7 ft model lets it load directly into trucks, eliminating re-handling of spoil after excavation. Other features include support of the wheel by an extra truck roller assembly giving a 4-point support. Structural strength of the whole wheel assembly is increased by making the stay rod supports of steel tubing instead of angles. Rims of wheel are cut from one solid plate of manganese steel and the segment teeth sections which drive the wheel are welded rather than riveted to the rims. This eliminates the weakening tendencies of closely spaced rivet-holes found in conventional designs.

CIRCLE (1) ON THE REPLY CARD

CONTRACTORS and gas distribution construction men faced with problems of making underwater crossing with gas mains will be interested in a new portable depth recorder that records depths from 2 to 300 ft. Total weight of the Bendix-Marine recorder and case is only 66 lb. Accuracy of unit is guaranteed within 2 percent.

CIRCLE (2) ON THE REPLY CARD

NEW "TURBO-FLAME" burner for use on scotch marine boilers where there is a known or possible back pressure or positive furnace pressure has been developed by The Mettler Company, division of Eclipse Fuel Engineering Company. Five standard model burners are included in the line, ranging in capacity from 1,000,000 to 5,000,000 Btu. Capacity is actually determined by back pressure developed in the furnace. Model TF-1 burner, for example, will burn 1,000,000 Btu against .5-in. w.c. back pressure, but actually has a maximum capacity of 1,-800,000 Btu with a 0.1 in. w.c. negative pressure or draft.

CIRCLE (3) ON THE REPLY CARD

SPRAGUE METER COMPANY has announced availability of synthetic diaphragms in two meter models — Types 175 and 240. Features claimed for these meters on the basis of laboratory and field tests conducted by Sprague include improved initial stability of proofs, and sustained accuracy over an extended period of years. Synthetic diaphragms manufactured by Vulcan Rubber Products and supplied with new 175 and 240 meters are adaptable to all existing Sprague meters of the same sizes in the field.

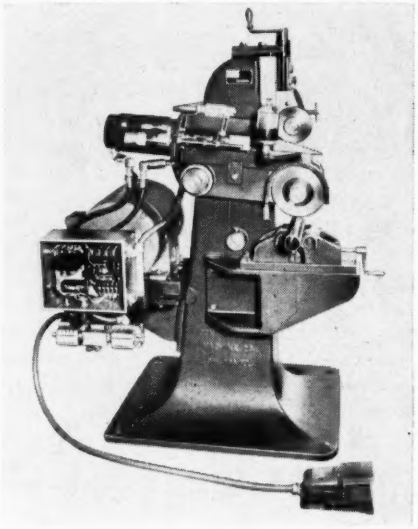
CIRLCE (4) ON THE REPLY CARD

NEW 1959 MODEL C-3 DITCH WITCH TRENCHER manufactured by Charles Machine Works is a re-designed version of the C and C-2 trenchers. New features include a positive acting spring loaded clutch that improves ease of handling; new ball bearing screw jack for the digging boom that triples speed of raising and lowering the digging chain; new spring loaded sprocket on digging boom that maintains correct digging chain tension at all times and allows rocks, gravel, nails and other foreign material to pass through without stalling the machine. Standard equipment includes a 2 ft depth digging chain with selection of teeth for digging 3, 4, and 6-in. widths.

CIRCLE (5) ON THE REPLY CARD

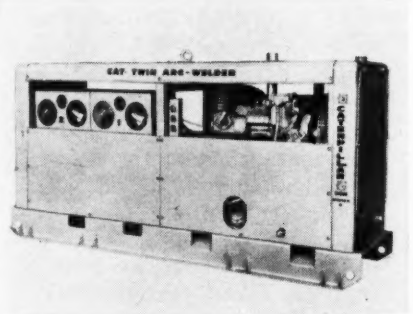
NEW GAGE for use in servicing fuel gas installation reduces the time required to test pressure, or check for leaks, to only about 3 minutes. Called a Pneumatometer, gage replaces 7 devices commonly used by plumbers and gas utilities servicemen, including the mercury manometer, water gage for inches, pound spring gage, ounce spring gage, refrigerator manometer, manometer for furnace manifold pressure, and a water vacuum gage. Unit reads out in lb-pressure up to 10 lb, and inches of w.c. up to 20-in. for either pressure or vacuum on one direct-reading scale.

CIRCLE (6) ON THE REPLY CARD



CONTINENTAL'S ROTARY PIPE AND TUBE cutting machines have electronic and hydraulic components to allow more pipes to be cut each day and a whole new group of exceptionally thin wall tubing to be cut without a toe-in of the cut edge. Hydraulic power check achieves a smooth cutting stroke by keeping an exact uniformly regulated cutting pressure on the wheel and work. Erratic feed, common to pneumatic systems, is completely eliminated. Machines cut pipe and tubes from ⅜ to 12¾-in. OD from light gage to ½-in. wall thicknesses.

CIRCLE (7) ON THE REPLY CARD



CATERPILLAR'S NEW PORTABLE TWIN ARC-WELDER is equipped with either skid base or running gear and uses the Cat D311 series H diesel engine and two Lincoln Electric welding generators. Each generator has a rating (NEMA) of 300 amps at 40 v. for simultaneous operation of two arcs. For parallel operation, the twin arc-welder is rated at 600 amps, 40 v. Current range of each generator is 60 to 375 amps. Two sets of generator controls allow welding at different voltages, amperages, and polarity at the same time.

CIRCLE (8) ON THE REPLY CARD

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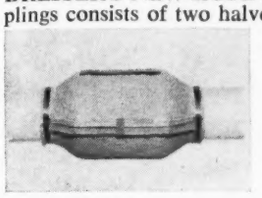
MAXITROL'S NEW GASLIGHT BURNER incorporates a new aluminum venturi tube that gives a better gas-air mixture and better gaslight burner operation. Burner produces uniform mantle lighting without dull or dark spots. Maximum candlepower is achieved without flame streaming from mantle top. New burner can be used with any standard gaslight mantle.

CIRCLE (9) ON THE REPLY CARD

DRESSER'S NEW KUPL-KOTER for field coating of pipe couplings consists of two halves constructed of rigid, moisture, and puncture resistant composition. These two halves are brought together around the coupling and clamped together with slip-on side clamps. Steel bands are placed around each end and drawn tightly by means of a standard hand banding tool. Unit which is left on the pipe after coating has been poured, handles all coatings at recommended pouring temperatures; is available in sizes from 3 to 12-in. ID.

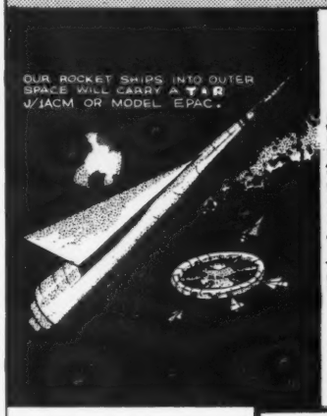


CIRCLE (10) ON THE REPLY CARD

AMERICAN METER'S new lightweight aluminumcase meter, designed for domestic service, reduces costs for shipping, handling and setting. The one-piece die-cast aluminum alloy body provides exceptional resistance to impact damage. Rated at 176 cu ft per hr of 0.60 sp gr gas at ½-in. w.c. differential, the new meter features self-lubricating porous bronze bushings, leakproof grommet-type seals, vented plastic index box, molded duramic diaphragms and reinforced flag rods. Maximum working pressure is 5 psi.

CIRCLE (11) ON THE REPLY CARD

DESTINATION: TOMORROW!



MODEL J/1ACM HOLIDAY DETECTOR WAS DESIGNED PRINCIPALLY TO BE USED AS A CONTINOUS INSPECTION DEVICE ON COATING AND WRAPPING MACHINES WHICH USE WATER FOR COOLING PURPOSES AND IN WHICH PROCESS ELECTRICAL INSPECTION OF THE PIPE IS DESIRED IMMEDIATELY FOLLOWING THE COATING AND WRAPPING.

THE J/1ACM CAN BE MODIFIED FOR USE IN CONTINUALLY INSPECTING PLASTIC SHEETS.

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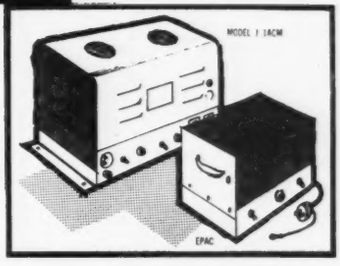

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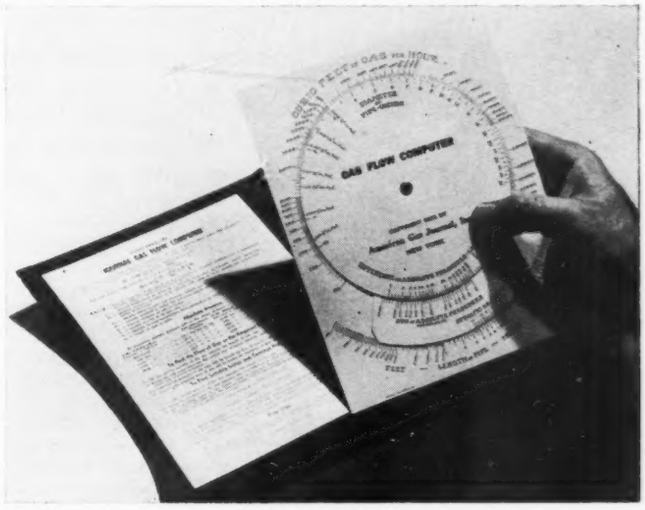
Cubic feet of gas per hour	10 to 500M
Pipe diameters	¾ to 48 in.
Pressure loss (inches)	.01 to 10
Specific gravities	1.5 to .35
Constants	1400 to 1000
Pipe length (feet)	30 to 30,000

FOR HIGH PRESSURES

Cubic feet of gas per hour	100 to 10MM
Pipe diameters	¾ to 30 in.
Difference in absolute pressure to	500 psi.
Sum of absolute pressures	20 to 2000 psi.
Specific gravities	1.5 to .35
Pipe length (feet)	100 to 5000
Pipe length (miles)	1 to 250



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The computers are printed on heavy durable plastic, enclosed in heavy plastic cases with complete instructions for their use.

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EASY TO OPERATE
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The H&M line, with seven models for 1½" thru 36" pipe, is the right way to put more profit into your pipe cutting operations. Contact H&M for full details.

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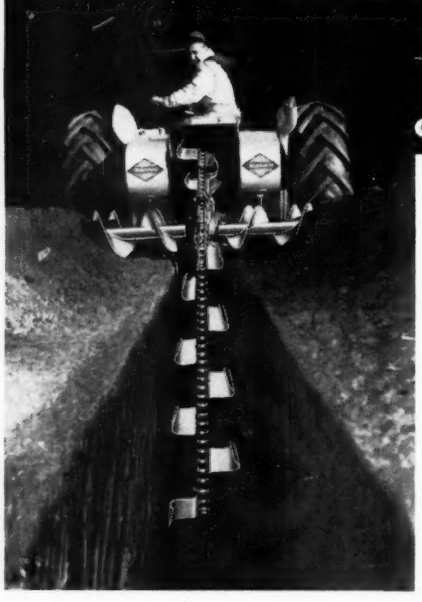

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- Less Maintenance
- Less Downtime
- One-man Operation
- Speed on the Job

When you see how the Auburn digs in soil conditions that no other trencher can, operates up to 800 feet per hour, and automatically adjusts speed to changing soil conditions, you'll understand why so many dollar-wise users buy Auburn. It has a simple, trouble-free design that has been proven through years of service. **Trenches 6 to 14 inches wide and down to 6 feet. Special bits are available for rock, shale, and frozen ground.**

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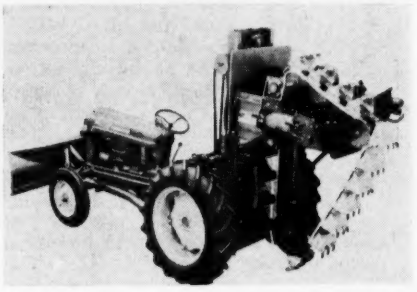
Jeep-A-Trench GEAR-DRAULIC
the original Jeep-mounted trencher, and only trencher approved by Willys Motors. Available at Jeep Dealers.

WRITE FOR COMPLETE INFORMATION and DEALER'S NAME
AUBURN MACHINE WORKS, INC. AUBURN, NEBRASKA, U.S.A.

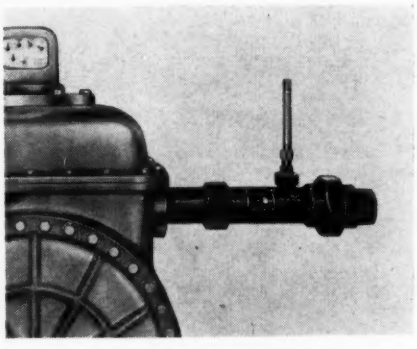


EVERETT'S NEW "RUGGEDIZED" 2000 series trenchers, manufactured by Earth Equipment Corporation, are designed for easy attachment to many models and makes of tractors, thereby offering the user much easier installation and maintenance. Trenching up to 24-in. in width is possible with new series, and optional bucket lines are available. Digging depth to 60 in. is available on model 2060 and to 42-in. on model 2042. New type conveyor is positive-positioning, hydraulically reversible, and self-cleaning. It is curved for greater height of spoil pile, and has optional mechanical or hydraulic drive, with mechanical transversing. Buckets come in standard 12-in. width (up to 18-in. width with extensions) and consist of 18 backless buckets per chain line. Optional bucket line offers 18-in. buckets digging up to 24-in. width extensions.

CIRCLE (12) ON THE REPLY CARD

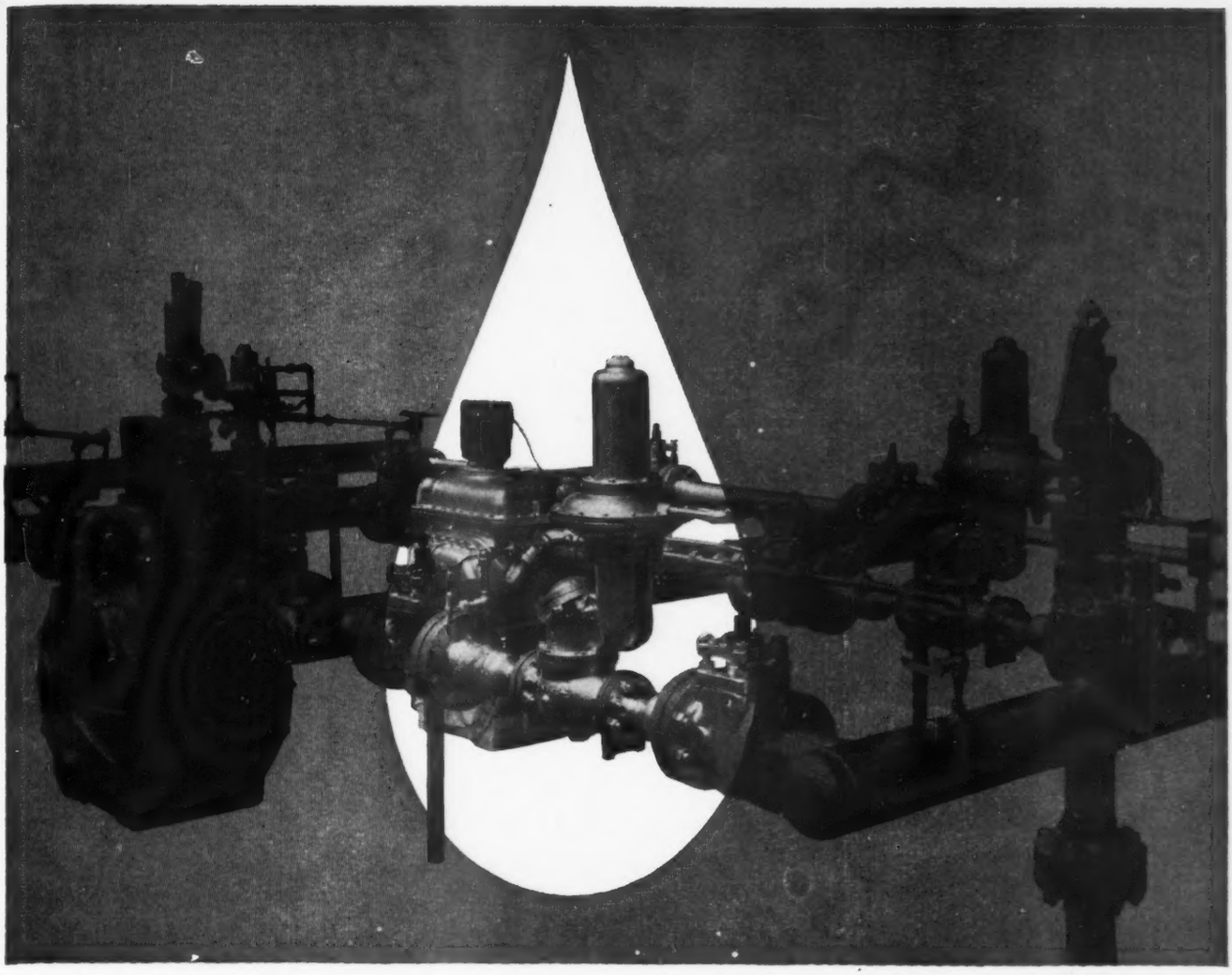
POLLUX GAS DENSITY RECORDER, which provides a continuous and accurate recording of the absolute gas density to meet every type of automatic process controlling requirement in the gas production industry, is now available in the United States. Recorder operates mechanically and is particularly designed to measure combustible gases and for installation in hazardous areas. Available with electrical contacts to provide audible and visual alarm.

CIRLCE (13) ON THE REPLY CARD



CRITICAL FLOW PROVER with maximum working pressure of 1000 psi is available from American Meter Company. Designed for field testing of positive displacement meters, with gas or air, at operating pressures of 15 psi or more, the new prover is equipped with 5 individually calibrated orifices and a thermometer. Orifice discs are calibrated in seconds per cu ft of air and are available with gas capacities to 6000 cu ft per hr. Fabricated from extra-heavy seamless steel tubing, the power employs O-ring seals at union joints for thermometer and orifice disc. Prover is available in 2-in. size for gas capacities from 250 to 6000 cu ft per hr.

CIRCLE (14) ON THE REPLY CARD



DEPENDABLE REGULATION WITH RELIANCE

ACCURATE MEASUREMENT WITH AMERICAN

Reliance CBV-201 high pressure, pounds-to-pounds regulators for economical first and second stage regulation on high pressure transmission and distribution systems. Rugged and dependable . . . for inlet pressures to 1200 psi and outlet pressures from 1 to 150 psi.

American 500B Ironcase Meters equipped with Base Volume Indexes accurately measure large gas volumes at standard conditions of pressure and temperature, as shown in the American installation above.

THE MOST ECONOMICAL—IN TERMS OF SERVICE! WRITE FOR BULLETINS CONTAINING COMPLETE INFORMATION

AMERICAN® METER COMPANY
INCORPORATED (ESTABLISHED 1836)

AMERICAN METER CO MEASUREMENT ENGINEERS

RELIANCE REGULATOR DIVISION
ALHAMBRA, CALIFORNIA

1897 1958

GOODMAN
USED SINCE 1897
2" HANDLE & LOCKING SLEEVE
GAS MAIN STOPPER

PIPE STOPPERS OF ALL KINDS

•

SAFETY GAS MAIN STOPPER CO. INC.

523 Atlantic Avenue

Brooklyn 17, N. Y.

Cable Address: GASTOPPER, N. Y.

DRAGNET
leak detector

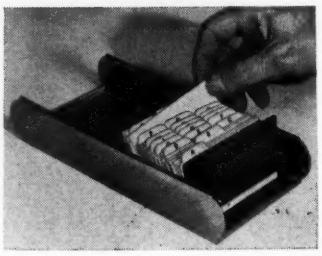
detects and locates leaks on any pressure piping system in a matter of minutes!

PATENTS PENDING

Here's the newest time-saver in the industry! The compact, portable Dragnet Leak Detector will detect even the tiniest leak on any pressure piping system for gas, steam, water or refrigeration. Unique "bubble action" principle much faster than by using pressure gauge or manometer.

SEND FOR BULLETIN 545

UNIVERSAL
CONTROLS CORPORATION
P. O. Box 13122
Walnut Hill Sta.—Dallas, Texas



FILE FOR YOUR BUSINESS CARDS. Practical card caddy, available from The Hahn Company, has alphabetical guides, adjusts to hold few or many cards of sizes up to 3½ by 2-in. Caddy is made of gold-tone aluminum for use on desk or in top drawer. Jr. size holds 750 cards; Sr. size, 1000 cards.

CIRCLE (15) ON THE REPLY CARD

PERMACEL'S NEW POLYETHYLENE PIPE WRAPPING TAPE is resistant to water, acids, alkalies, solvents, salt water, oil and fungus growth. Works well over a temperature range from minus 30 F to plus 180 F pipe temperature and remains flexible at extremely cold temperatures. Can be applied by any type automatic pipe wrapping equipment.

CIRCLE (16) ON THE REPLY CARD

COMPUTERS, INC. of Houston has announced a new electronic flow measuring system for monitoring or controlling gas flow. System is composed of transducers to measure pressure and temperature, a computer, integrator, and counter. Accumulated volume is registered on a mechanical counter, and also on a strip chart, optionally. Differential pressure input is 4 to 100 percent for 100 percent of differential pressure. Maximum working pressure is dependent on transducers only. Signals from the system can be telemetered or used to control flow.

CIRCLE (17) ON THE REPLY CARD

COMPLETE LINE OF GAS-FIRED BOILERS for residential, commercial, industrial and farm uses is now available from H. C. Little Burner Company. Among the new features being built into the line are: Draft hood with a new vertical to horizontal design that reduces overall height of boiler and permits basement installation with a 6 ft ceiling; new aluminized steel flue-collector that resists corrosion from all gases; and patented staggered fins on sides of sections that present maximum heating surface area to the action of hot flue gases.

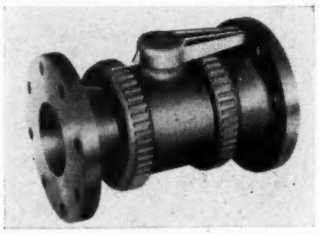
CIRCLE (18) ON THE REPLY CARD

A READOUT FORM PRINTER with a 12-decade capacity and an automatic form ejector has been developed by Electronics Division of Clary Corporation. Unit is an extension of the Clary Parallel Entry Data Printer with a paper transport mechanism that positions pre-printed forms precisely. Typical application include recording automatic checkout data, logging instrumentation data, recording quality control reports, automatically recording inspection records and printing gummed labels and inspection tags. Printing data sources include digital volt meters, shaft position transducers of both the decimal and coded types, EPUT meter, electronic counters, step switch banks and relay banks. An original and three carbons can be printed on special "carbonless" paper on either 3 by 7-in. or 3 by 3-in. sizes at the rate of 2½ lines per second.

CIRCLE (19) ON THE REPLY CARD

PYROMERSE is the trade name of a new tank heater unit far smaller than conventional units of the same capacity that is now available from Combustion Research Company. The gas-fired immersion heater utilizes a new design principle to yield greater heat transfer efficiency, consumes less fuel, and has about half the weight and tank displacement of tubular-construction units. New heater is easily removable from the tank without loss of production or draining of the tank. It is portable and can be easily transferred to a stripper tank when cleaning is necessary. Pyromerse efficiency is said to be 75 to 80 percent in water base liquids. Its heat exchanger section is a thin hollow rectangular duct instead of a tube. Efficiency is increased because hot combustion gases are drawn through the heat exchange duct by exhaust fans, causing energy producing pressure drop to occur in the exchange portion of the unit. Units operate on either natural, LP or manufactured gas and are available in standard sizes up to 4,000,000 Btu per hr capacity. Larger sizes can be fabricated where required. All heaters are available with automatic temperature controls, electric pilot ignition, safety equipment, and fully automatic operation. Program timers are optional.

CIRCLE (20) ON THE REPLY CARD



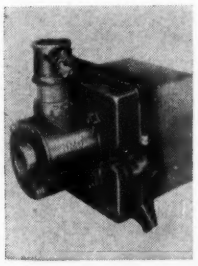
NEW ALL-PLASTIC, molded 4-in. ball valve is venturi-throated, has straight-through, non-turbulent low pressure drop flow characteristics, and is fitted with 150# flanges. Of compact and sturdy construction, featuring ¼ turn shutoff, and provision for seat seal take-up, the valve is available in PVC types I and II, Kralastic, polypropylene, and Penton.

CIRCLE (21) ON THE REPLY CARD

NEW "WORK BULL" UTILITY TRACTOR manufactured by Massey-Ferguson incorporates many features formerly found only on big tractors. Three-point foot acceleration and instant no-shift change of direction are among new unit's features. Tractor will achieve speeds up to 16 mph utilizing tht 4-speed transmission with Hi-Lo range. Other features are full-time power steering, multiple disc hydraulically actuated reversing clutches, and a torque converter that automatically adjusts power between speed and load requirements.

CIRCLE (22) ON THE REPLY CARD

NEW HAUCK BURNER has been developed for heating processes requiring sealed-in firing with any commercial fuel gas. Lighting is positive at any burner setting on hot or cold furnaces, kilns, or retorts. Combustion is more quiet than with premix burners. And since the air and gas mix is at the burner outlet, there is no flashback.



CIRCLE (23) ON THE REPLY CARD

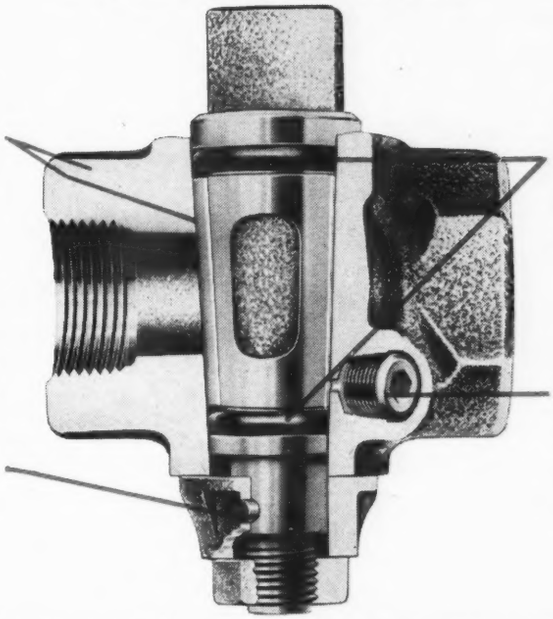
Now . . . a full line!

MUELLER®

125 pound LubOseal® *stops*

Iron body and bronze key—ground and lapped to perfect fit prevents leakage through the port.

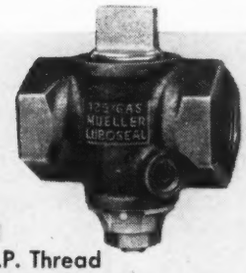
Heavy bronze washer secured to key by steel drive-lock pin in blind hole to permanently maintain perfect adjustment between key and body and to prevent tampering. Stop safely operable without nut.



"O" rings at top and bottom of key provide dependable seal to prevent leakage to the atmosphere.

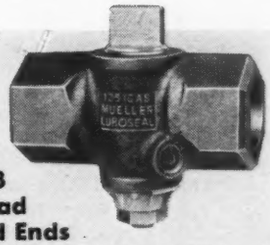
Entire sealing surface and both "O" rings quickly and easily re-lubricated through independent port in body. Assures continuous easy turning.

iron body, bronze key—working pressures to 125 psi

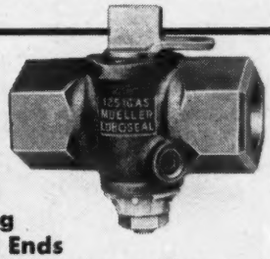


H-11170
Plain Head
Inlet: Inside I.P. Thread
Outlet: Inside I.P. Thread
Finish: Black or Galvanized
Sizes: ¾", 1", 1¼", 1½", 2", 2½"

H-11175
Lock Wing
Inlet: Inside I.P. Thread
Outlet: Inside I.P. Thread
Finish: Black or Galvanized
Sizes: ¾", 1", 1¼", 1½", 2", 2½"



H-11173
Plain Head
Recessed Ends
Inlet: Recessed Inside I.P. Thread
Outlet: Recessed Inside I.P. Thread
Finish: Black
Sizes: ¾", 1", 1¼", 1½", 2"



H-11178
Lock Wing
Recessed Ends
Inlet: Recessed Inside I.P. Thread
Outlet: Recessed Inside I.P. Thread
Finish Black
Sizes: ¾", 1", 1¼", 2"

New! H-11199
Re-lubricating Tool
Simple, handy tool for re-greasing all LubOseal Stops to restore original turning ease. Tool is screwed into grease port of stop and handle turned — that's all there is to it! Convenient H-853 Grease Sticks just fit tool to eliminate waste.

NO-BLO®

The features of these products are typical of the attention to detail in research, design and engineering that becomes a part of every Mueller No-Blo product manufactured for the gas industry. Write for complete information.

GEM

MUELLER CO. SERVING the Natural Gas Industry SINCE 1857 QUALITY

MUELLER CO.
DECATUR, ILL.

NEWSREEL

GAS APPLIANCE MANUFACTURERS ASSOCIATION has elected Edward A. Norman, president of Norman Products Company of Columbus, Ohio, as president of the association. He succeeds Clifford V. Coons, executive vice president of the Rheem Manufacturing Company of New York. Other officers elected at the 24th annual convention held April 1 are: First vice president, Wendell C. Davis, president of Cribben & Sexton Company, and second vice president, William G. Hamilton, Jr., president of American Meter Company. Re-elected as treasurer was Stanley H. Hobson, chairman of the Geo. D. Roper Corporation. Harold Massey, GAMA managing director, is also secretary of the association.

E. A. Norman

GAS AIR CONDITIONER TRAINING schools planned by Arkla Air Conditioning Corp. for the remainder of 1959 will cover maintenance, service, application engineering and sales. Five-day Schools concerned with maintenance and service of the 3½ and 5-ton Sun Valley and 25-ton water chiller units will be conducted monthly throughout the year at Arkla's factory in Evansville, Indiana. Schedules are so designed that anyone attending the small tonnage class may remain in Evansville during the following week to attend the water chiller school. Application engineering and sales classes will be held in Little Rock with two water chiller classes scheduled for May and October; and small tonnage classes scheduled during May, June, November, and December. Details available from Arkla.

IN AN EFFORT to encourage use of gas in operation of air conditioning equipment in Chicago, Peoples Gas Light and Coke has requested permission from the Illinois Commerce Commission to extend gas service to large apartment buildings and industrial and commercial establishments on an "only when needed" basis by the year-round firm gas customers. In one request Peoples Gas asked approval of a 3.4 cents per therm rate for air conditioning service in large apartment buildings of 100 or more units during the period March 15 to November 15. In order to qualify for the low rate, customer would have to have 10,000,000 Btu capacity equipment (equivalent to 200 boiler hp), all necessary piping and appurtenances to supply gas to individual apartments in the building, and gas must be used for cooking in at least 90 percent of the living units. In a second request, Peoples Gas seeks authorization to furnish interruptible boiler fuel service to additional commercial and industrial customers who currently use less than the present minimum of 50,000,000 Btu per hour, but not less than 25,000,000 Btu, and who use a substantial part of the steam output from the boiler plant for air conditioning.

INDISCRIMINATE USE of natural gas as industrial boiler fuel will soon make the United States and Canada "have-not" nations so far as this fuel is concerned, Jerome J. McGrath, general counsel of Fuels Research Council, Inc., told the West Coast Producers Institute, Inc. The FPC, he said, "after avoiding the question for years," has recently given signs of considering conservation of natural gas as an irreplaceable resource, but a sound natural gas conservation policy is still needed. The spokesman for the coal industry also charged that some natural gas pipelines are "tilting their rates to load most of their operating expenses on residential, commercial and firm industrial consumers." This, he said, allows large industrial customers, "who buy gas of an interruptible, off-peak basis, to get practically a free ride."

DEMISE OF THE STREET CAR is helping protect the New Orleans gas system from corrosion, S. E. Trouard and E. A. Wagner, Jr. of the New Orleans Public Service, Inc. told a symposium on cathodic protection at the recent South East and South Central district meeting of the American Institute of Electrical Engineers. The old rails from the street car systems are buried deep in the ground beneath the gas lines to form anodes that prevent the coated steel gas mains from corroding. The rails are utilized in shallow beds, if the terrain permits, otherwise they are buried, end up, in deep holes.

AN INCREASE OF 2.5 PERCENT in the amount of gas used by electric utility plants for generation of electricity was recorded in the 12 months ended January 31, 1959, reports the FPC. During the same 12 month period, a decrease of 1.6 percent for coal used and a 4.3 percent increase in oil used was registered. All in all, during the 12-month period, electric utilities fired their boilers with 1.377 trillion cu ft of gas.

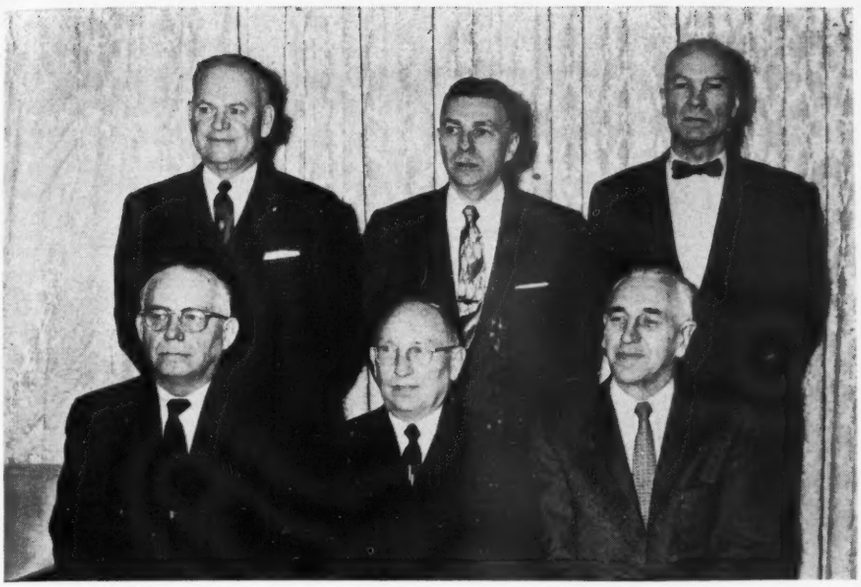
THREE NATURAL GAS COMPANIES plan to battle the two new taxes being proposed in Pennsylvania, on underground storage of natural gas, and gross receipts. The underground storage tax would add an estimated $700,000 and the 14-mill tax on gross receipts another $2,400,000 a year to the combined tax bills of the three companies. Neither tax has been charged natural gas companies before. Spokesmen for Equitable Gas Company, Peoples Natural Gas Company, and Manufacturers Light and Heat Company have challenged the taxes, describing them as discriminatory on the grounds that western Pennsylvania stores and uses more gas than any other part of the state, and because competing fuels, such as coal and oil, are not subjected to these taxes.

BROOKLYN UNION AND BROOKLYN BOROUGH Gas Company stockholders have approved consolidation of the two companies. The continuing company will be known as The Brooklyn Union Gas Company and will serve all of Brooklyn and Staten Island and a substantial portion of Queens. Approval of the Public Service Commission is still to be secured.

FRENCH PLAN TO PIPE SAHARA NATURAL GAS to Britain, Western Europe. Maurice LeMaire, France's former minister for industry and commerce, has drawn up a plan to pipe natural gas from newly discovered gas reserves in Algeria to Britain and western Europe. The Organization for European Economic Cooperation has a special committee studying the project, and is considering another plan to bring gas to Europe in liquid form by tanker. Under the LeMaire plan, the gas would be brought from Hassi R'Mel in the Sahara through south Morocco and Gibraltar crossing Spain and France to supply the Paris area. From there branch lines would supply London and the Lorraine basin in eastern France.

DELAWARE POWER & LIGHT COMPANY of Wilmington, Delaware, has become the 121st company to be exempted from Federal Power Commission regulation under the Hinshaw Amendment to the Natural Gas Act.

Shades of the Past . . . Two authentic 19th Century gas lights and two modern gas lights now grace the grounds of the Seattle Museum of History and Industry. Presented by Charles Clise, vice president of Seattle Historical Society by Washington Natural Gas Company president, Charles M. Sturkey, the nostalgic symbols of another era represent the period from January 3, 1874 to 1901 when Seattle downtown streets were lighted with gas lights. In modern use, gas lights have recently been installed as runway lights at the Benton, Arkansas airport. And Oklahoma City and Russelville, Arkansas airports are to get them soon. *(See story page 44.)* (Left to right) John Heffernan, American Meter Company, in oldtime policeman's uniform; Ellsworth C. Dehl, retired senior fitter; Harold E. Linton, retired shop foreman; Frank L. Shiefen, retired senior fitter; and Dean Draper, retired customer service supervisor of WNG.



♦ **NEW NEGA OFFICERS.** 1959-60 officers for the New England Gas Association are: Front Row, left to right, George R. Copeland, incoming president (president, Algonquin Gas Transmission Co.) Andrew W. Johnston, retiring president (vice president in charge of gas operations, Boston Gas Co.); Gilbert J. Williams, 1st vice president (executive vice president, The Connecticut Light and Power Co.). Back Row, left to right are: Harold L. Dalbeck, 2nd vice president (president, Gas Division of New England Electric System); Burdette A. Johnson, treasurer (treasurer, New England Gas and Electric Association); and Clark Belden, clerk (managing director, NEGA).

SPECIALLY-PRICED AIR CONDITIONING UNITS are available to engineering colleges and universities for instructional purposes under a new plan proposed by Arkla Air Conditioning Corporation. Local gas companies, in cooperation with Arkla, can also make the units available to colleges at little or no cost so that graduating engineers can be instructed in operation of the single-coil year-round units and particularly in the heat adsorption principle they employ. W. G. Wepfer, Arkla general sales manager, noted that most gas companies who engaged in selling air conditioning conduct training schools for their engineers.

SELECT GROUP OF UTILITY EXECUTIVES will meet at Arden House July 26 - August 7 for the Eighth Utility Management Workshop that will concentrate on "The Job of the Manager" and "The Decision Process." Among speakers at the 13-day course is J. Theodore Wolfe, president of Baltimore Gas & Electric Co., and C. S. Stackpole, managing director of A.G.A. The workshop, now in its eighth year, is designed specifically to meet needs of executives in the public service industries and is distinguished by its method of operation based on intensive work in small groups.

GAS AIR CONDITIONING SALES SCHOOL, the first to be sponsored by the A.G.A. Industrial and Commercial Gas Section, is scheduled for June 1 - 5 at the Baker Hotel in Dallas, Texas, and will feature presentations by manufacturers, consulting engineers, and gas utility people who are experienced in the air-conditioning field. Program has been designed to acquaint gas company sales engineers with products and sales techniques in the large tonnage air conditioning class (25 tons or larger). Series of lectures will cover fundamentals of air conditioning, the various types of systems, the refrigeration machine, air handling equipment, controls, and accessories. Highlight of the program will be a field trip to visit air conditioning installations in the city of Dallas where gas engine driven, steam turbine driven equipment, and absorption equipment is in operation. Details on each installation will be given by lectures.

NEW! 1959 *Air-Cooled Condenser* MODELS

IN OPERATION AT S.G.A. Convention Exhibit Room 3 2nd Floor JUNG HOTEL

Comfortemp

Gas Powered

AIR CONDITIONING SYSTEMS

— meet the ever-growing demand for efficient cooling at sensible cost

- *Completely Automatic*
- *Quiet in Operation*
- *Cuts Cooling Costs in Half*
- *Easy to Install*
- *Low Cost Maintenance*

5 - TON and 7½ - TON (Based on 105° ambient air.)

You will want full information about the new 1959 *air cooled* COMFORTEMP air conditioners, with features never before included in gas-powered units. Soundly engineered and quality constructed throughout! Now ready for delivery.

WATER COOLED MODELS

. . . in 3-ton and 5-ton capacities, introduced in 1958, are still available.

Call, wire or write for COMPLETE INFORMATION

Comfortemp DIVISION, COMFORT PRODUCTS, INC.

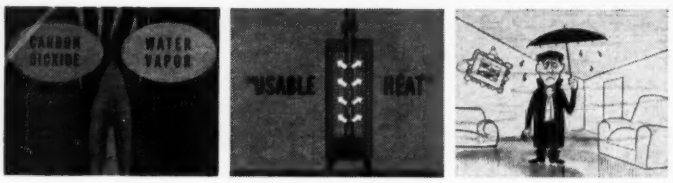
440 HILLBURN DRIVE • P. O. BOX 1211 • DALLAS 21, TEXAS

THIS NEW
METALBESTOS
FILM CAN WORK FOR **YOU...**

HEAT IN HARNESS

The Story of Gas Venting

Every utility service-man will readily grasp the importance and the principles of correct gas venting after seeing the new Metalbestos 27-minute color strip film, "Heat in Harness: The Story of Gas Venting." The first film devoted exclusively to the subject of gas venting, "Heat in Harness" corrects many popular misconceptions about gas venting . . . presents accepted venting practices in a fresh and original manner.



From the gas flame . . . through the appliance . . . into the home itself.

"Heat in Harness" traces the correct path which vent gases must follow in order to insure complete health and safety to your customers.

"HEAT IN HARNESS" *is already part of the curriculum of many utility training programs. To learn how you may obtain free showings of this educational and entertaining film, write to Dept. AA-5*

METALBESTOS DIVISION
WILLIAM WALLACE COMPANY · BELMONT, CALIF.

News

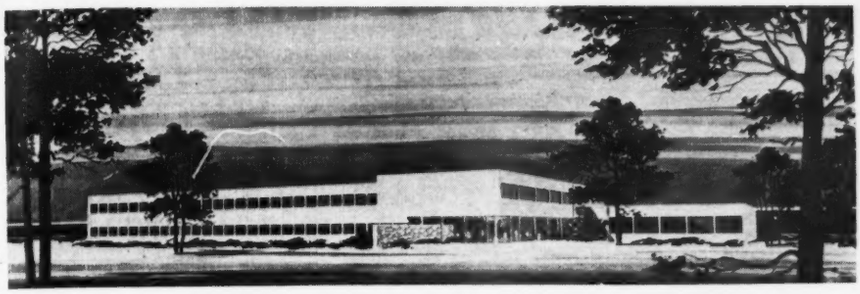
"NEW HORIZONS for Growth and Service" will be the general theme of the American Gas Association's 41st annual convention to be held October 5-7 in Chicago. Co-chairmen of the three-day convention are Eskil I. Bjork, chairman of The Peoples Gas Light and Coke Co., and J. J. Hedrick, vice chairman of the board of Natural Gas Pipeline Co. of America. The "New Horizons" theme reflects our primary objective, Bjork said. "We will offer gas industry executives a **clearer picture of things to come** so that they may return to their own companies better equipped to meet the challenges of the highly competitive era just ahead."

THE 1959 APPALACHIAN UNDERGROUND CORROSION Short Course, sponsored by the West Virginia University, will be held in Morgantown, West Virginia, June 2, 3, and 4. Problems of underground corrosion, fundamentals, control practices, coatings, instrumentation, materials and test procedures will be covered in the 65 classes scheduled for the three-day course. Field demonstrations and exhibits by 38 manufacturers and suppliers will be presented.

DRAKE & TOWNSEND, INC. has organized a new service specializing in a system of inspection procedures for all types of LP-Gas plants. Recent changes in NFPA and Pamphlets 58 and 59 have set new regulations for safe and efficient operation of LP-Gas Plants which were not designed into plants constructed prior to 1957. Draketown LP-Gas Plant Inspection Service will also enable plant owners to comply with insurance carrier requirements in order to maintain present rates.

TEMCO, INC., of Nashville, Tennessee, has acquired the inventory, tools, and dies for production of gas space heaters formerly manufactured by Magic Chef Division of Food Giant Markets. Temco will manufacture the line in 1959 under the trade mark "Magic Chef-Wonder Warm."

SOUTHWESTERN GAS MEASUREMENT 34th annual short course was held at the University of Oklahoma's College of Engineering, Norman, Oklahoma, April 14, 15, and 16. Dean W. H. Carson, College of Engineering and chairman of the executive committee of the course, has announced the following subcommittee chairmen for this year's short course: R. R. McCafferty, Pioneer Natural Gas Co., program subcommittee; Howard S. Gray, Tennessee Gas Transmission Co., publications subcommittee; Charles R. Stephenson, Michigan-Wisconsin Pipe Line Co., practical methods and registration subcommittee; William R. Ruff, Jr., Southern Natural Gas Co., exhibits subcommittee; Miss Thelma T. Jones, Oklahoma Utilities Association, publicity subcommittee; Charles D. Peterson, Universal Controls Corp., exhibitors subcommittee. Approximately 90 persons will teach the short course which will cover fundamental problems of the man in the field, shop practices, and engineering applications. Several new members have been elected to fill vacancies on the general committee of the course including Miss Thelma T. Jones, James W. Pofahl, El Paso Natural Gas Co.; Charles H. Rambo, The Gas Service Co.; Orville W. Barnett, Rockwell Manufacturing Co.; and P. A. Palmer, Sprague Meter Co. Miss Kate A. Niblack, who retired from the general committee after more than 25 years service has been designated as a "Distinguished Service Committeeman."



NEW $550,000 ADDITION to the general office of Permaglas division of A. O. Smith Corporation at Kankakee, Illinois, has just been completed. It is part of a $5,000,000 expansion and modernization program which will also include a $115,000 warehouse, $105,000 research and test facility, modernizations and additions to existing manufacturing plants all in Kankakee, and acquisitions of a water softener plant in Omaha and a water heater production plant in another marketing area. The office expansion allows consolidation of accounting, sales, advertising, and credit with plant activities. The two-story addition was constructed as a wing to the east side of the existing building. It covers 16,000 sq ft and houses about 150 employees.

WILLIAM WALLACE COMPANY plans to build a complete manufacturing plant at Logan, Ohio, at an estimated cost of $750,000. Present building schedules call for completion of the 55,000 sq ft building by July 15. Complete line of Metalbestos products will be manufactured at the new Ohio facility as well as at the headquarters plant in Belmont, California.

SOUTHWESTERN ELECTRONICS COMPANY, a division of Dresser Industries, Inc., has opened a new 300,000 sq ft research, development and manufacturing facility that covers 146 acres in Houston, Texas. On this new site, SIE will produce electronic instrumentation for a worldwide market, including electronic test instruments for industrial applications, and complete systems for remote and automatic control of gas pipelines.

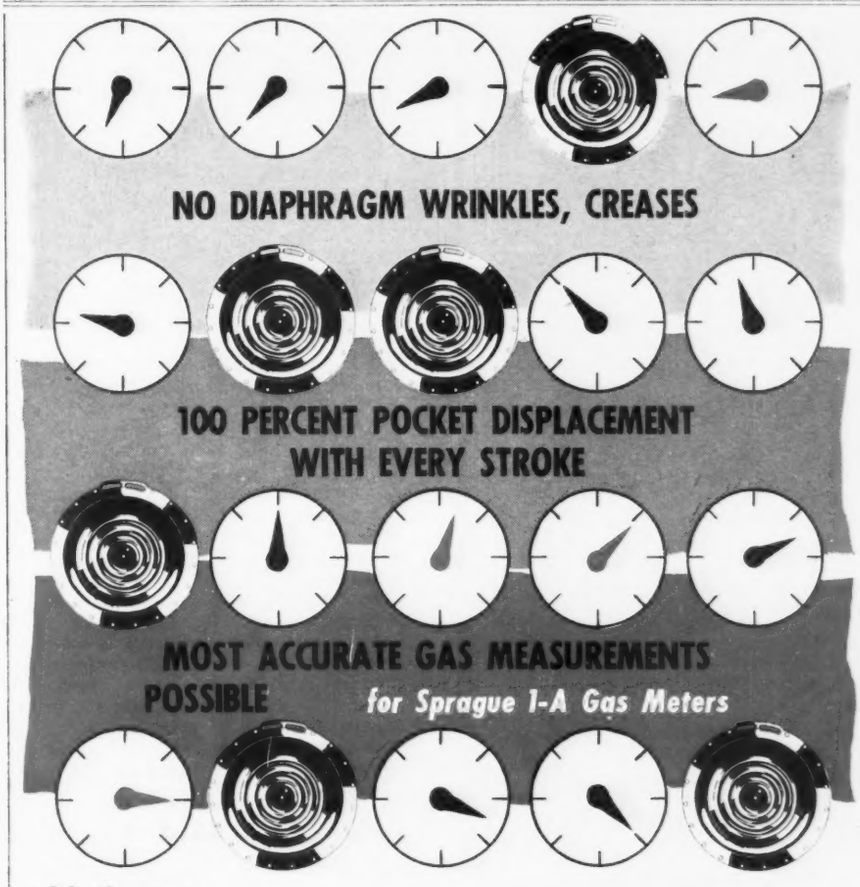
JOHN DEERE Industrial Equipment Works in Moline, Illinois, will start construction this spring of an addition that will double production capacity of its new manufacturing plant just completed last fall. Construction is scheduled to be completed in April 1960.

SIMILARITY OF CORPORATION NAMES has given rise to considerable confusion and misunderstanding in the gas industry. A corporation with offices in Baltimore, Maryland, and New York City has changed its corporate name to one very similar to Universal Controls Corporation of Dallas, Texas. The firm lists its common stock on one of the leading stock exchanges and recently there has been rather wide fluctuations in the stock's price and consequently considerable publicity regarding both the company and its stock. Universal Controls Corporation of Dallas, Texas, with home office and plant at Carrollton, Texas, is the original Universal Controls, manufacturing gas service regulators and many other gas distribution products. For 12 years these products have been distributed internationally and advertised in national trade journals.

THE UNITED GAS IMPROVEMENT COMPANY, Philadelphia, has purchased the physical assets and inventory of McNay Gas Corporation, trading as Ward Bottle Gas, Ephrata, Pennsylvania. U.G.I. will continue to operate the enterprise through its subsidiary, Ugite Gas Inc., which was formed to handle its bottle gas business.

KOPPERS COMPANY, INC. plans construction in 1959 of a new research center at Monroeville, Pennsylvania, that will include an administration building, three chemical laboratories, a power plant, and supporting facilities.

EDWARD G. GILMORE, widely-known authority in the gas measurement industry, has been employed as a consultant by Reynolds Gas Regulator Company of Anderson, Indiana, a wholly-owned subsidiary of Arkansas Louisiana Gas Company. Gilmore was formerly chief engineer for Lancaster Meter Parts Company of Lancaster, Ohio, residing in Tulsa where he carried on their development and research work until his recent appointment as consultant for Reynolds.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BOOKSHELF

Future Energy Sources for Pennsylvania, *by John J. Schanz, Jr., published by The Pennsylvania State University, Department of Mineral Economics, University Park, Pennsylvania. Pages, 166. Price $3.*

Cost and supply of future energy sources of the United States and the world for the next hundred years is related to the future energy sources and demand for the state of Pennsylvania in this new report. Coal, oil and gas—energy sources currently utilized in Pennsylvania — are first investigated. Then an evaluation is made of energy sources not currently employed but which may offer promise for the future such as atomic energy. Charts correlate information previously published on future reserves of fossil fuels, energy demand, and production predictions for U.S. and world. Report is considered unique because of the extension of the study of world energy sources to the regional state level. Future cost of energy from fossil fuels is investigated and an analysis is made of the probable role of atomic energy in the state as a result of a shortage of fossil fuels, or the attainment of a competitive cost level by atomic energy.

Business Budgeting: *A Survey of Management Planning and Control Practices, by Dr. Burnard H. Sord and Dr. Glenn A. Welsch, published by Controllership Foundation, Inc., Two Park Avenue, New York 16, New York. Pages, 366. Price, $12.50.*

Report details steps involved in establishing and approving profit objectives, developing a detailed plan of operations; communicating objectives; forecasting sales and expenses; developing standards of performance; reporting results and correcting significant deviations from the plan. Emphasis is placed on participation in setting goals and determining standards of performance. Survey is based on responses from 424 leading companies in the United States and Canada, chosen because they reputedly are doing a better-than-average job of planning, budgeting, and controlling operations. Survey responses and related data are presented in 93 tables and 12 charts.

Residential and Commercial Air Conditioning, *by Charles H. Burkhardt, published by McGraw-Hill Book Company, 327 West 41st Street, New York 36, New York. Pages, 325. Price, $9.*

New textbook and technical volume covers planning, designing, installation and servicing of residential and commercial air conditioners. The basic theory of refrigeration and air conditioning is presented in simple terms, and information on calculating heat gains, sizing the cooling system, installing the unit, and its various components, and installing and operating the controls are given. Trouble-shooting and servicing after the unit is installed are also explained. New advances in absorption cooling, air-cooled condensers, water towers, and compressor and component servicing are discussed. Unique chart method for servicing is included.

Shot Peening, *6 edition, published by Wheelabrator Corporation, 1810 South Byrkit Street, Mishawaka, Indiana. Pages, 193. Price, $2.50.*

New edition of the Shot Peening textbook includes latest information obtained in research, development, and practical applications. Approximately 200 pages of printed and illustrative material including photographs, drawings, diagrams, charts and graphs are included. First part of book is devoted to applications—such as pipe cleaning — and advantages of shot peening and the equipment and procedures involved. Second part covers theory of prestressed surfaces in relation to shot peening and reviews the history of surface compression methods and their relation to fatigue.

Technical Societies Guide, *published by Industrial Publicity Association, Room 1616, 41 East Forty-Second Street, New York 17, New York. Pages, 32. Price, $3.*

Procedures required by technical societies and trade association for presentation and preparation of papers has been prepared to serve as a reference manual for both the industrial publicist and engineer. Guide contains data on: Membership structure, principal meeting dates, subjects of interest, paper requirements, mechanics of contribution, policies on preprints and reprints, restrictions and rights to papers, and data on each society's publication and publicity policy.

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BULLETIN BOARD

CATALOGS—BROCHURES—TECHNICAL DATA

POCKET SIZE HANDBOOK of basic technical information for gas industry servicemen is now available from Rockwell Manufacturing Company's Meter and Valve Division. Prepared specifically for gas meter and regulator service men, the 48-page "Gas Products Handbook of Technical Data" contains reference tables and data concerning meter and regulator specifications and dimensions. Also included are discussions on inflammability limits of gas, flow of gas in pipes, low pressure flow in pipes, pressure equivalents, selection of type and size of regulators, factors that affect metering of gas, and physical laws of gases.

CIRCLE (61) ON THE REPLY CARD

NEW "ULTRA FILTER," described in a bulletin from Mine Safety Appliances Company, provides a minimum removal of 99 percent by particle count of particulate matter 0.3 micron and larger diameter at rated flows. Accessory elements are also available for gaseous contaminant removal.

CIRCLE (62) ON THE REPLY CARD

V. D. ANDERSON COMPANY'S new bulletin describes their line of purifiers, scrubbers, mist extractors, and separators for the natural gas industry. Four principal liquid and dust type scrubbers are cataloged including the Type LD for removing dry dust entrainment in natural gas distribution lines, and Type LDW for exceptionally high degree of dust recovery and where wet scrubbing is permissible. Detail drawings, complete size data, description, applications and photographs are shown of all types.

CIRCLE (63) ON THE REPLY CARD

WELDING FITTINGS CATALOG just published by Dresser Manufacturing Division of Dresser Industries, covers Dresser's expanded line of seamless carbon steel welding fittings. The 20-page, two-color catalog contains complete tables of specifications, product photos, engineering drawings, ASA tables and manufacturing details.

CIRCLE (64) ON THE REPLY CARD

PICTORIAL FOLDER describes Palmer-Shile Company's standard size adjustable storage racks that can be used for almost any plant or warehouse application to store materials and merchandise. Adjustable shelves lock into vertical panel slots. There are no small pieces, and bolting or welding is not required. Racks are of channel steel construction and can be used with pallets, skids, boxes or barrels. Available in 4 pieces—standard vertical panels each 98 in. high, and standard shelving of 3 different lengths, 54, 90, and 108 in., each 30 in. deep.

CIRCLE (65) ON THE REPLY CARD

CLEVELAND TRENCHER'S 190 pipeline backfiller with its new water-cooled throw-out clutch is described in a new 6-page, black and red folder. Copy describes new throw-out clutch which is cooled by continuous circulation of water from the engine's cooling system. Clutch prevents overheating, and provides accurate day-long continuous casting controls.

CIRCLE (66) ON THE REPLY CARD

1959 CATALOG of automatic emergency lighting equipment from Electric Cord Company describes with photographs and specifications, the light warden line, which unlike ordinary emergency lighting units, contains no manually operated switches or timers. Units are designed to provide emergency lighting instantly and automatically whenever a power failure occurs.

CIRCLE (67) ON THE REPLY CARD

SCHIELD BANTAM'S new series "350" Bantam crane-excavators are described in new 8-page specification bulletin. Complete specifications, capacities, work ranges and features of the 11-ton carrier-mounted model, the 11-ton self-propelled model, and the crawler-mounted Bantam are included, as well as the complete line of attachments.

CIRCLE (68) ON THE REPLY CARD

SURFACE COMBUSTION'S automatic dew point recorders and controllers that indicate, record and control the dew point of gas atmospheres in continuous or batch furnaces and atmosphere generators are described in new 6-page, 2-color gate folder titled "Autocarb." How system controls carbon potential is described; installation photos, illustrations of the new standardized line of control instruments, and a chart for selecting proper system are also included.

CIRCLE (69) ON THE REPLY CARD

NEW CATALOG of gas-fired industrial incinerators illustrates, describes, and gives complete specifications for the Winnen stationary and portable heavy-duty incinerators, in a wide range of standard sizes, as well as Wincinators custom-built to any size, pre-fab chimneys and other special equipment.

CIRCLE (70) ON THE REPLY CARD

ROYAL McBEE CORPORATION'S new brochure describing the LGP-30 General Purpose Computer gives specifications, basic features; illustrates major components and lists applications. Operation of control panel and simple 16-part command table is described. New optional photo-electric punched tape reader, which operates at 200 characters per second, and combination high-speed reader and punch unit are illustrated.

CIRCLE (71) ON THE REPLY CARD

CHART describes Nationwide Leasing Company's special package lease plan for the gas industry that allows large and small firms to expand and modernize facilities without depleting their liquid working capital. Plan allows any combination of equipment to be lumped together in one package, under one lease for 3 to 5 years, with one monthly lease payment.

CIRCLE (72) ON THE REPLY CARD

"1959 — A Year of Opportunity for the Gas Cooking Load," a new publication from the American Gas Association, reviews the market for 1959 A.G.A. approved gas ranges, and the importance of the dealer in the sale of such ranges. To qualify for the A.G.A. "Blue Star Seal of Approval," all domestic gas ranges must include automatic lighting of all burners. New publication also includes a summary of a program being used by a large eastern utility company in promoting A.G.A. approved gas range sales through dealers. A suggested plan-of-action for gas companies interested in increasing dealer sales of gas ranges in their respective territories is also featured.

CIRCLE (73) ON THE REPLY CARD

COMPREHENSIVE CATALOG of vertical and horizontal pumps manufactured by Peerless Pump Division is now available. The 110-page general catalog contains specifications, photographs, applications, cut-away drawings, and four pages of composite charts show application of Peerless vertical and horizontal pumps by broad head and capacity ratings. Catalog also contains a large section of engineering information including definition of pump terms; orifice charts, pipe weights and dimensions; field testing methods; equivalents of flowing water, weights and measures, temperature, pressure, and mechanical and electrical units.

CIRCLE (74) ON THE REPLY CARD

NEW HOT WATER BOILER is subject of 8-page bulletin from Orr & Sembower, Inc. Built in 18 sizes from 500,000 Btu per hr to 20,000,000 Btu per hr, new hot water heating boiler is designed especially for forced circulation hot water systems for institutional, commercial, and industrial space heating. Boiler marks a departure from the practice of using steam boilers of conventional design for hot water service. Curves, tables, charts, and photographs amplify explanation of new hot water boiler.

CIRCLE (75) ON THE REPLY CARD

LIQUEFIED PETROLEUM GAS ASSOCIATION'S FIRST BOOK in its 4-volume service training course is now available. Same basic material is utilized in such a way that it may be used by students studying alone, by industry or association sponsored classes, or by vocational education schools. The initial book, like the 3 to follow, was prepared by University of Texas under a grant-in-aid provided by LPGA; covers LP-gas properties, standards, distribution, and customer relations. Other books to be published in 1959 will cover installation, service, and operation of major appliances and equipment; transportation and bulk plant operation; and commercial, industrial, agricultural and carburetion applications. Book 1 comes in 4 parts: An information manual used as a student text, an instructor's guide, a student assignment guide and a test book. Price information is available from University of Texas Extension Division.

CIRCLE (76) ON THE REPLY CARD

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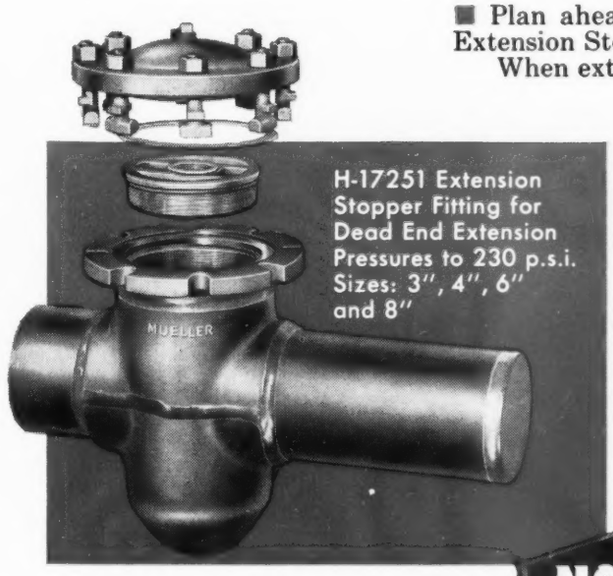

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